ELECTRICAL REVIEW

[ILLUSTRATED.]

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The Brush Incandescent System.

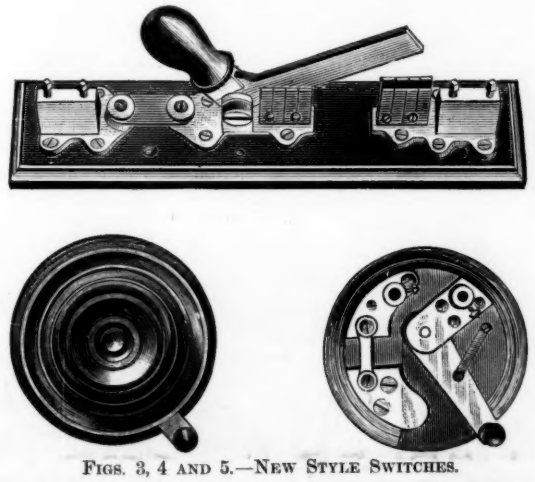
The field for incandescent lighting is ever widening. Large and small interiors are everywhere being illuminated by this light, and its popularity is daily growing. The vast superiority of the electric light over gas or oil has met with full and public recognition. It secures freedom from impure and overheated air, from the moisture and noxious vapors produced by illuminating gas, which are unhealthful as well as destructive of fabric and decorations of all sorts; it affords safety from fire, and yields a steady, brilliant light, which shows everything in its true color, like sunlight. But the problem before electrical engineers has been not simply to produce a good light, but also to produce an *economical light*. The Brush Electric Company claims to have solved both questions in arc lighting eight years ago, and now solved them in lighting by incandescence. Accurate measurements of the power absorbed by their 150-light machines, conducted at Philadelphia by the Westinghouse Machine Company, gave a result of about 10¼ lamps per horse-power. Later measurements of the larger machines, it is stated, have shown as high a result as 11½ lamps per horse-power, or nearly double the efficiency of other systems. This remarkable efficiency, and the great durability of the lamps, combine to reduce the cost of maintenance enormously.

The Brush dynamo machine for incandescent lighting, Fig. 1, is entirely self-regulating. Its great advantage is its perfect automatic action in controlling the lamps without any resistances, regulators or other outside devices, which are very wasteful of power. The first cost of an installation is thus largely decreased, and the ease and economy in operating are greatly enhanced. The machine is built to operate lamps of 16 to 20 candles, and 8 to 10 candles each, the 16-candle lamp being the standard. Thus the F^5 machine for 300 lights will maintain 300 16-candle lamps, 600 8-candle lamps, 200 16-candle and 200 8-candle lamps, or any other combined numbers up to its limit, allowing 2 8-candle lamps in place of each 16-candle lamp. Lamps of higher power, up to 150 candles, can also be used on the same circuit.

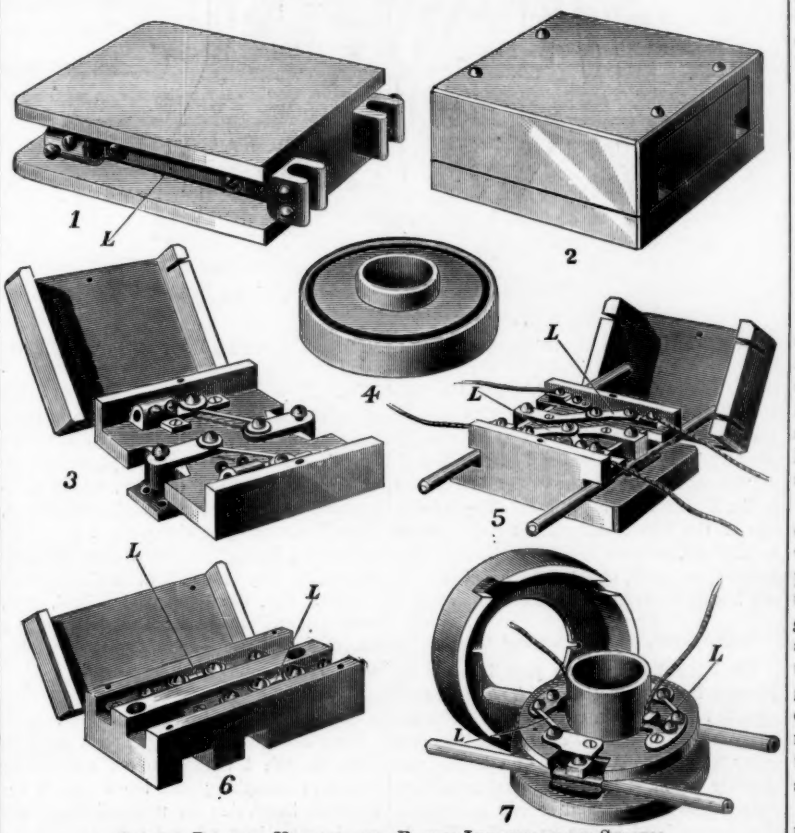
With the dynamo machine running at a uniform speed, it is shown any number of lights, from one up to the maximum number, may be turned on or off without the employment of any regulating devices, the automatic regulation of the machine itself being faultless; the extinction of a single light shows immediately a corresponding saving of power.

The Brush Company make the following broad claims for these machines:

1. More lamps per horse-power than have been produced from any competing machine.
2. Higher efficiency per weight of material.
3. Perfect automatic regulation in the machine itself. All outside regulating devices are dispensed with, and much better regulation is obtained than with machines using regulators.
4. An accurate relative saving in power for each light turned off—a result obtained by no other machine.
5. Greater simplicity in the machine itself, and in an installation where it is employed.
6. It affords greater safeguards against fire. No outside regulator can act as quickly or sensitively as this machine.
7. It is the least expensive machine to operate, because it is the most economical, efficient and simple.



FIGS. 3, 4 AND 5.—NEW STYLE SWITCHES.



SAFETY DEVICES USED IN THE BRUSH INCANDESCENT SYSTEM.

1 and 2, Floor Junction and Cut-out. 3, Forty-light Cut-out. 4 and 7, Electrolier Cut-outs. 5, Two-branch Junction and Cut-out. 6, Standard Double-pole Cut-out for Moulding. L, Safety Fuses.

The lamp, Fig. 2, used by the Brush Company, is the Swan, invented by Joseph Swan, of England. This lamp has now been extensively employed in both countries for more than five years. It has been successfully used in all kinds of lighting. The great Atlantic lines of ocean steamers use it largely. It has been thoroughly successful in the lighting of mills and factories, war and merchant ships, business blocks, hotels, large stores, theaters, newspaper and printing offices, dwelling-houses, etc. Those who have used it practically speak most highly of it. The standard lamp is of 16 to 20 candle-power—superior to a strong five-foot gas-burner. At 16 candles its length of life is very great. A slight alteration in the adjustment of the dynamo machine will make the difference between 16 and 20 candles in the lamps, and this matter may be regulated to suit the user. Over thirty installations of these machines are now in successful operation, employing more than four thousand lamps.

Figs. 3, 4 and 5 illustrate switches in use by the Brush Company that have been giving the best of satisfaction.

Some of the many valuable safety devices in use by the Brush Company are shown on this page. They are named as follows: 1 and 2, floor junction and cut-out. 3, forty-light cut-out. 4 and 7, electrolier cut-out. 5, two-branch junction and cut-out. 6, standard double-pole cut-out for mouldings. L, safety fuses.

The Proper Elevations for Electric Lamps.

NEW ORLEANS, LA., May 21, 1885.

Editors Electrical Review:

In the REVIEW of December 13th, 1884, I read the following Editorial Notes in relation to the exemplification of the tower system in Detroit, Mich., and the elevation of the lamps for the lighting of the streets of Boston:

"I note what our Detroit friends say in their letter in last week's REVIEW about the tower system in vogue in their pleasant city. I was sorry not to stop there on my way East; but time pressed, and I had to come straight through. A friend in Boston, who has just been out there, says the lights present a wonderfully beautiful appearance from Windsor, across the river; but that, in his opinion, for purposes of illumination, the post system is far more effective and economical as to number of lights required. Of course, this is only one man's opinion, but he is something of an expert. My idea is that masts and towers are excellent for open spaces, like Madison and Union Squares in New York, especially if supplemented by a liberal fringe of electric lights round the edges; but I cannot think that any one will seriously maintain that, in a compactly built city, mast illumination, however beautiful it may be, is going to light streets as effectively as the same or even a smaller number of lights placed at proper intervals along the streets on posts not too high.

"And this leads me to say that in most cities—Boston being one of them—the electric lights used for lighting the streets are placed higher in the air than need be. The thing to be done is to light the streets—*the ground*, not the *air*—and as long as the lights are high enough to be out of the way, say twelve or fifteen feet, what is the use of going higher? In cities where the wires are carried on poles there is perhaps a good reason for the higher level, but it has no force in Boston, where practically all wires are on housetop structures."

My astonishment at reading these comments must be my excuse for the delay in answering them. In the discussion of this subject, the first step to be taken is to determine the *purpose* to be attained in electric lighting. If the purpose is to secure the greatest possible local intensity of light, to use the greatest possible number of lamps for the illumination of a given area, and to make the lighting of a given area as expensive as possible, then your view of the subject is the correct one; but if the purpose is to provide an illumination of sufficient intensity for the actual necessities of

business; to light the greatest possible area with a given number of lamps, and to reduce the cost of lighting to a figure which will enable the electric light to compete its cost with gas for the lighting of a given area, your theory is not correct. Is it desirable that the intensity of light in streets, or other areas lighted by electricity should be such as to render it an expensive luxury? Low lamps cause intense light; intense light costs excessively. The object of the tower system is to provide a means of illumination which can be enjoyed by the poor, as well as the rich. It is by far the most economical means for lighting by electricity. Persons who want a street light of sufficient intensity to enable them to read fine print do not admire the tower light as it is ordinarily installed.

In the opposition to the tower system shown by your Boston correspondent, I I cannot but think he has opposed one of the best means for the development of the interests of electric lighting; the only means which has demonstrated the possibility of the general illumination of large areas by the electric light at a cost which compares favorably with the cost of lighting by gas.

He suggests as the proper height for the placing of single lamps for the lighting of streets, an elevation of twelve or fifteen feet, instead of the elevation adopted in Boston, (which he does not give). As an amendment, I would propose an elevation of from fifty to seventy-five feet, and as an argument in favor of the amendment would present the fact that in ordinary city lighting by gas, lamps of sixteen candle-power are placed at a height of ten feet above the street. The intensity of the light from these lamps has for years been recognized as sufficient.

Again, intensity of light being recognized as sufficient for all practical purposes, with lamps of a given candle-power, the elevation of the lamps should be increased as the candle-power of the lamps is increased, in accordance with the following rule, relating to the diffusion of light: "The intensity of the light from a given source, at any point distant therefrom, is inversely as the square of the distance." Applying this rule if you increase the candle-power of a gas lamp from sixteen to sixty-four, its elevation should be increased from ten to twenty feet. In other words the local intensity of the light from a sixty-four candle power gas lamp, at an elevation of twenty feet, would be exactly equal to that of a sixteen candle-power lamp at an elevation of ten feet. (By local intensity, I mean the quantity of light received upon a square foot of horizontal street surface at a given angle from the sourse of light in either case.) Continuing the application of the above rule to a lamp of two thousand candle-power, the proper elevation would be nearly one hundred and twenty feet, from which elevation, if the figures are correct, the local intensity of the light upon the surface of the street, at a given angle from the source of light, would be equal to that of a sixteen candle-power lamp at an elevation of ten feet, and the diameter of the area of illumination would be increased in the proportion of one hundred and twenty to ten. As a compromise between your proposed height of twelve feet, and a theoretical elevation of one hundred and twenty feet, we will assume that from fifty to seventy-five feet is the proper elevation of single electric lamps, of two thousand candle-power, for the *economical* diffusion of their light.

Respectfully yours,
JOHN S. ADAMS.

* * A new system of automatic electric signals for the use of railways has been invented by Mr. W. T. Waters. The signals are all automatic in their action, and by an ingenious and effective combination are verified. A train moving over a line of these signals will protect itself from collision, both in front and rear, maintaining control of the indications shown on two posts in advance, and two posts in rear. One train cannot approach nearer than one block to another, nor can it interfere with the signals of another. There is evident merit in this invention and it will no doubt receive prompt attention from practical railroaders.

Technically Amusing.

The editors of *The Indicator*, at Stevens Institute, Hoboken, have a keen eye for the ridiculous, and we cull a few from the last issue of that paper:

"*Prof.* (with every evidence of one who is conversant with natural philosophy): 'The water reservoir was covered with a perfectly green scum, and such was the greenness of this scum, I have not the least doubt that if a *verdant* cow had chanced that way, *he* would have stopped to *graze*, I'm sure.' And the class smiled some."

"Student in the chemical laboratory, after vainly trying to adjust some apparatus, leaves in disgust. Interview some time after with the professor, who had meanwhile set the unruly machine:

"*Student:* 'I didn't leave it that way. Some D. F. has been fooling with it.'

"*Prof.* (blandly): 'Then I must be a D. F.'

"Group about the large magnet. Professor (endeavoring to magnetize a file presented by a student, with indifferent success): 'Gentlemen, this is strange. I—have—*ugh*—a—*ugh*—magnetized a great many files, but never—*ugh*—found one so obstinate.' But recollection suddenly coming to his aid, his face brightens and he inquires: 'Is this one of Hawkridge's files? Well, that solves the mystery.' File is retired and labeled N. G."

"The average age of the two highest classes in the High School is 17 years. The average age of the two lowest classes could not be ascertained, as some of the members had not learned to speak, and those who could did not know, but referred us to their nurses."

SHEPARD'S NEW COMBINED STANDING AND SEAT SCREW-CUTTING FOOT OR POWER LATHE.

Shepard's Screw-Cutting Lathe.

The lathe shown on this page is made on purpose for manufacturing. The cross-feed slide is 7 inches long, covering the screw entirely from dirt, and adding more than any other feature to the stiffness of a lathe. Ordinarily on most lathes of this size they are only 3 inches long, and screws uncovered. The reverse head is one in truth. You do not have to stop the lathe in cutting screws, but by pulling a handle the lathe instantly reverses itself. It cuts either right or left-hand screws, or feeds either way. The spindle is of 1¼" steel, has ⅝" hole clear through spindle; centers are warranted true and heads in line with each other and with the bed. The lead screw is covered, so no dirt falls on it. Is wide bed. Tail-stock sets over for tapers; centers self-discharging. Mr. Shepard furnishes all of the gears to cut from 3 to 40 threads, as per index.

In the description of this lathe, Mr. Shepard, whose manufactory is at 134 East Second Street, Cincinnati, makes the following claims: "From long experience in building foot lathes, I became convinced that the foot lathe of the future should be one that could be run standing or sitting, and I now present the one before you. While standing you can work anywhere about the lathe, as well as on my former lathes, and while sitting you can also reach all over. Many jobs can best be done standing, and many best by sitting. If you have a long, tedious job, you have the advantage of sitting; also of gaining an immense power by the double crank; also you need never touch the belt, for you have the cranks under control all the time. The crank-shaft is also balanced, and does not give the throw sometimes observed on other lathes. You really have four times the power possible on an ordinary foot lathe, and it is no trouble to take an eighth of an inch cut on these lathes; also you can on this lathe bore out a 4-inch hole on engine cylinders easily, turn 8 inches by foot, and a screw as large as the lathe will swing between centers, and over the rest, five to the inch. Centers are interchangeable, and nose of spindle is ¾ for 12 threads. The anxious question of 'What shall we do with our boys?' seems answered by buying them one of these lathes. For colleges, where accuracy and instruction in mechanics are desired, these lathes are just the tool. I have furnished the Artillery School at Fortress Monroe, the Military School, Ky., Deaf and Dumb Asylum, Ky., the Geological School, Ky., with lathes. Professor Crandall made a micrometer caliper on one of my lathes, which, of course, requires accurate tools."

The Ghost of the Telephone.

I am not what you might term superstitious, though I confess to an undefinable feeling of something near the region of my timorous heart, and an unsteadiness of my pedal extremities, when I pass alone by a graveyard near the hour of midnight. That these sensations are produced by fear, there is scarcely reason to doubt. But fear of what? Surely, I would reason with myself, there is absolutely nothing to be afraid of—ghost never had an existence save in the crazy brains of ignorant, imaginative people—even were there such things, no ghost would ever trouble me. I have a clear conscience, and never did anything that would cause any of my deceased friends or relatives to come back and haunt me. Even my dear departed mother-in-law was the recipient of naught but kindness at my hands. Then I would start up briskly and whistle cheerily until I had passed the dreaded spot.

But once after I had taken charge of a telephone exchange, my views upon this subject received a severe set back, and I was very nearly forced to reluctantly admit that I entertained a decided belief in the supernatural.

I was exceedingly zealous with my work in the exchange, and in order to give the best of service, was frequently under the necessity of discharging some of my operators. Of course we did not pay much salary, and this was the principal cause of my not being able to employ efficient help.

One day, when I had been more than usually annoyed by complaints of subscribers about the mistakes of green hands at central, an old telegraph operator, whom I had known in my early telegraph days as a wild, erratic genius, came into my office and expressed the greatest and most effusive delight at seeing his old "pod," as he familiarly termed me.

With the free and easy sociability of his class, my friend Ben Joplin was perfectly at home in three minutes, and was up at the switch board, calling the young lady operators by their Christian names and talking soft nonsense to them in ten: he understood the board thoroughly, and although he necessarily distracted the attention of the operators somewhat, he amply made up for it by assisting in answering calls and making switches, and it is safe to say that for the next week our service was perfection itself.

One day, however, my friend Ben came in the office considerably under the influence of liquor, and not having sense enough to keep away from the board, he crossed the wires, mixed up the girls, and played smash generally.

Not being possessed of a disposition of angelic amiability, and fearing the loss of my reputation and, *ergo*, my situation, I advanced upon Mr. Joplin, and, grabbing him by the collar, fired him incontinently out the door, closing it after him.

The next day I received a note saying that I had given Mr. Joplin such an impetus when I thrust him out the door that he had been unable to check himself and had fallen headlong down the stairway, sustaining serious injuries; that he had managed to pick himself up and walk to the house of a friend, who was now taking care of him. The note was not signed, but from certain peculiarities, I suspected it had been written by Ben himself, in a disguised hand.

From that day my exchange went down. It seemed as if something bewitched it; the operators all left, and I had to employ green ones; not only that, but I was obliged, not being able to procure reliable assistance, to remain at the office at night myself.

There is nothing fascinating about night work. I remember when, years ago, I put in a few months as night man at a "sixing" station, I thought there was nothing to live for but the break of day; everything was gloom—solemn, silent gloom—broken only by the monotony of the sounder as it "o. s'd" or "sixed" in spasmodic jerks.

The night owl at the lonely way station has an unenviable time of it, but the midnight watcher in a telephone exchange becomes a dreary being.

The first night passed very well; I was in a beautifully savage humor, and passed the most of my leisure time in blessing (or otherwise) the parties who had forced this work upon me.

The second night found me in no better humor, but I had exhausted my vocabulary of choice expressions, and feeling very tired, determined to try to get some sleep. About 11 o'clock the calls grew less frequent, and at 11:45 I connected the night alarm and stretched my weary body upon a couple of tables. I lay a few minutes thinking of the probable outcome of thus sacrificing my peace of mind and physical health upon the altar of good service, and listened to the doleful clang of the court-house bell as it rang out the hour of midnight. Ere the twelfth stroke had been reached I was asleep.

Suddenly I was awakened by a most infernal ringing, that put my brain in a whirl. I fell off the tables and sat upon the floor, dazed and bewildered. Finally I made a dive at the board and stopped the crazy bell; then I glanced at the number of the drop; my blood grew cold; it was number 94, and 94 was the cemetery!

Shaking off the superstitious fear which had caused me to tremble from head to foot, I answered:

"Hello!"

"Hello!" came back.

"What is it?" I asked.

"What do you want?" asked Cemetery,

"What do *you* want? I answered your ring."

"Some one rang here. I don't want anything," was the reply.

"I didn't ring; must be a cross," said I.

I knew better, however; the voice came too well and clear for a cross. I turned from the board, and lay again on the tables, but no sleep came to my eyelids; in vain I tried to convince myself that it must have been a cross, or that the man at the cemetery was making game of me; this latter proposition, however, was decidedly untenable. The sexton, whose voice I had readily recognized, was an old, gray-headed, sober-visaged man, and not given to joking. I could not account for it, but I tortured my brain until morning with an endless number of ridiculous and absurd explanations.

The following night, just as the last stroke of the bell in the court-house tolled the hour of midnight, the diabolical night-bell again rang out in wild alarm, and number 94 again dropped.

I answered with fear and trembling, and the conversation of the preceding night was repeated.

I admit that I *was* frightened. I experienced a peculiar sensation at the roots of my hair, and can swear it was about standing on end. I determined to put up with this no longer. Reliable or not, I would employ the first man I could get to take this night watch.

The next day I was so worn out that I went home and kept my bed until near evening. I then arose, went down town, and, after a long hunt, found a man who agreed to take the place, but asked that I let him off until midnight, when he would relieve me. I begged him to come a few minutes before that time, but he said that he was obliged to go across the river into a neighboring town, and probably would be a little later than 12—certainly he could not get back before.

I calmly submitted to the inevitable, and when the court-house bell commenced its dismal telling at 12 that night, I was seated in front of the board, my eyes nearly bursting from their sockets, and gazing fixedly at drop 94. I had not attached the alarm, so when, as the last peal sounded, and drop 94 fell, only the buzzer was heard; feeling somewhat emboldened by the knowledge that I would have company in a few minutes, I answered the call.

"Hello!"

"Hel-lo, Cen-tral!" came in low, measured and sepulchral tones, causing my flesh to creep and my hair to follow suit.

"Wh-what is it?" I asked, in terror.

"Is that you, Jingo?" asked the voice in hollow, blood-curdling accents.

I stood aghast.

"Hel-lo!" said the same, sepulchral voice.

"Ye-yes, it's me," I replied nervously.

"This—is—my—third—call—but—not—my—last! You—threw—me—down—stairs—and—killed—me! I—am—Ben—Joplin—and—I'll *haunt* you FOREVER! Ho! ho! ho! ha! ha! ha!"

As the horrible, mocking laugh sounded in my ear, I fell backward into the arms of my relief, who had that moment entered the room.

"No. 94!" I cried wildly, pointing to the switch board, "talk to him—quick!" I then fell in a swoon.

When I came to my senses, my new operator was bending over me.

"Did you get 94?" I asked eagerly.

"Yes," he replied, "but he didn't want anything. I told him you had just been talking there, but he said no one talked from his phone."

I make no pretence of being a brave man; I never had a particular hankering after a cannon's mouth, nor have I ever distinguished myself by rescuing terrified females from burning houses, or stopping runaway horses; yet, for all that, I arose from the floor with no trace of faintness, and although my cheek was pale, there was a deep-seated resolve in my heart to confront Ben Joplin or his wraith, or find a solution of the mystery.

The next morning I took a trip out to the cemetery and interviewed the old sexton. He told me that on the previous night his bell did not ring, but on the two nights prior to that it rang at precisely 12 o'clock.

I looked out the window of the little stone house and noticed a line running away from it to the opposite direction in which I had come. The sexton answered my look of inquiry by saying that the wire was a continuation of No. 94, and that it ran down to the old house he formerly occupied, but since his removal, no one had taken it down; he said the inspector had been out a few days before this hunting some trouble, which he reported having found on the line between the old house and the new one, and had told the sexton that he would come out soon and take down this piece of line.

I saw that 94 was not grounded at this house, and, satisfied that I would soon find the solution of the mystery, started out toward the old house. After proceeding about a hundred yards I noticed the wire was down and lying on the ground near one of the poles; upon a closer inspection I found that the end of the wire was firmly buried in the ground; then for the first time I saw that it entered a newly-made grave. I glanced at the plain head-board and read the simple inscription, "Unknown."

Is it possible, thought I, that poor Ben died and was buried without so much as his name being known?

I shuddered. Then, as a feeling of my old fear crept over me, I turned and precipitately fled from the spot.

I met the old sexton at the door of the new house and narrated what I had seen; he referred to his register and the description of the corpse tallied with that of Ben—the deceased, the record stated, had died at the hospital from injuries received in a fall.

I was clearly very much affected and alarmed, and at the request of the sexton, told him the whole cause of it.

"Yes, it's strange," said the old man, after I had finished, "but it's merely a coincidence. Keep on your hunt and you'll find the trouble yet."

Struck by this sensible advice, I started for the office, following the wire, to ascertain if it had been tampered with. About a quarter of a mile from the cemetery stood the electric light establishment, and as I glanced along the wire as it ran along the side of the house, I noticed it had been cut and the rim of a bottle inserted, then a wire was connected at each side of the cut and carried into a window of the building.

I felt somewhat better when I saw these evidences of unghostly tamperings, and as I was well acquainted in the building, obtained permission to come out that night and investigate. Accordingly, at 11 o'clock, I was in

THE BRUSH-SWAN INCANDESCENT LAMP.

the office of the electric light works and patiently awaited developments.

I must have fallen asleep in my chair, for, in what seemed a very short time, I heard a long, vigorous ring on the telephone; listening, I heard:

"Hel-lo!" in slow, measured tones.

Then again, in half a minute:

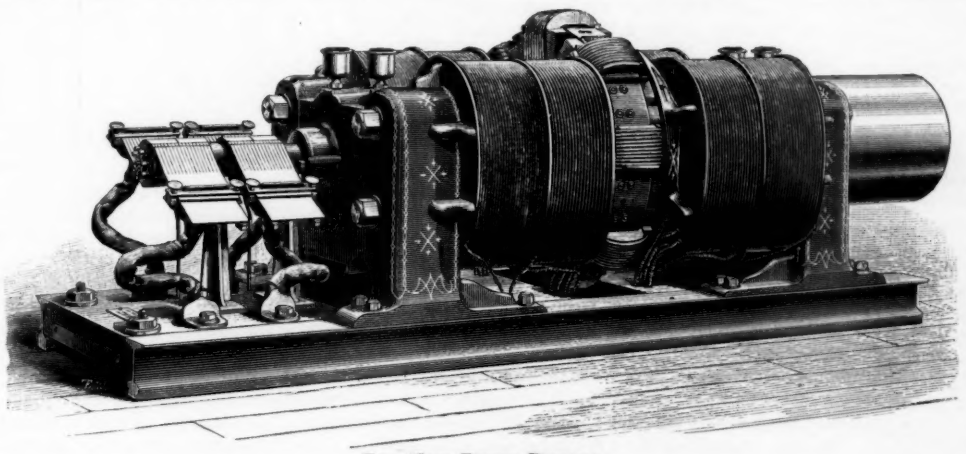
"Is—that—you—Jingo?"

I jumped out of my chair, ran across the room to the telephone, and there, in the full glare of the electric light, was Ben Joplin, just as he used to look.

"Ben," I cried, "what kind of a racket is this you're giving me?"

Ben gave me a surprised look, turned on his heels, and, with a loud cry, vanished through the open door. I followed quickly, but he had disappeared.

I have never seen him since, nor have I been troubled with ghosts, but I *would* like to have a photograph of the body in that grave.—*Texas Rail and Wire.*



THE NEW BRUSH DYNAMO.

.... A day or two ago Mr. Gould was quoted saying that Western Union earnings were increasing, and business was surely reviving throughout the land. Now a member of the Western Union executed board says the earning have been impaired by low rates, but they are sufficient to continue 1¼ per cent. dividends quarterly.

The Conduction Theory of Thermo-Electricity.

BY F. KOHLRAUSCH.

The article is a reply to Budde's objection to the author's conduction theory, according to which the thermo-electromotive force is to be sought in the heat currents which exist in every actual thermopile; Budde being a supporter of the contact theory, which recognizes the seat of the thermo-electric force as being at the junctions.

Budde objects that the conduction theory can only agree with the second law of thermo-dynamics if the thermo-electric series can be represen ed by a quadratic expression as a function of the temperature. In order to explain the Peltier effect, the author has assumed that the electric current carried heat along with it; and to this Budde strongly objects, since he says there can be no sense in saying that heat, which is not material, but only a form of energy, is capable of motion in a wire at a constant temperature. Differences of the heat distribution may be equalized, but where there are no differences there cannot be anything of the nature of a current.

Edelmann's Variable Ammeter Shunt.

At the left-hand end of a stout wooden base are fixed two blocks of metal in line, and at the right-hand end are three similar blocks. Between these blocks are stretched four stout copper wires, or, if necessary, rods may be used; these wires are arranged in the metal blocks, so that wire No. 1 has one end in the top right-hand block, the other end and one end of wire No. 2 being in the top left-hand block; the middle right-hand block is the terminal for wires 2 and 3, the lower left-hand block is the terminal for wires 3 and 4, and the lower right-hand block is the terminal for the other end of wire 4. The leads from the dynamo machine are brought to the upper and lower right-hand blocks, so that the current must follow a zigzag course through all four wires. At seven equidistant points of the wires are soldered smaller pieces of wire, which serve as terminals for the galvanometer circuit; while six more terminals, equidistant among themselves, but at $\frac{1}{8}$ the distance of the former seven, serve for a similar purpose. In this way 35 different lengths of the shunt may be included between the terminals of the galvanometer, each length being $\frac{1}{35}$ of the total resistance of the shunt.

Edelmann's Portable Asiatic Galvanometer.

The lower of the two needles hangs inside a copper damper which is placed inside the coil; the upper needle, to which is affixed an aluminium pointer, hangs above the graduated circle. The coil, together with the damper, etc., are enclosed in a wooden cylindrical box, to which the two terminal screws are fixed, while the graduated circle is contained in a glass-capped cylinder placed on the top of the wooden box. The whole is movable on a central pivot provided with a three-legged base. The needle is suspended by an eye to a fiber, which is fixed to a torsion head at the top of a vertical tube fastened on the glass plate by a screw cut at its end. By means of this screw the whole tube with suspension and magnets can be lowered, so that the tube rests on the upper magnet, which itself lies on the divided circle In this way the needle is firmly gripped, and the instrument can be moved about without fear of breaking the suspension fiber. The divided circle is movable, so that it can be turned round to make the zero point coincide with the plane of windings of the coil.

.... A Philadelphia dispatch says the sheriff has levied on all the stocks and interests of the Postal Telegraph Company, and like treasures are looked for in New York.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, JUNE 6, 1885.

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If the present management of the Erie Telephone Company really desire to enhance the value of its stock, which the unwise course pursued since they came into power compels many to doubt, it would seem the sensible plan to divert some of the money they are paying eminent attorneys in Lowell to those channels that would aid in putting their house in order in Minneapolis and St. Paul. A few dollars' worth of material, and a decent salary paid for the services of an experienced and capable telephone manager, would soon work a decided change in the unpleasant condition of things telephonic in these cities. These subscribers are entitled to good telephone service, and should have it. The day for poor service to be quietly endured by telephone patrons is past, and the Erie management would do well to heed this fact. It is inexcusable with the present facilities at command.

Answers have been filed by the United States Electric Light Company to a number of the suits brought by the Edison Company, although the defendants have a month to spare before legally required to do so.

The Paris telephone system is built for all time, with concealed double wires, and beautifully furnished and equipped central offices. Should the multiple principle be adopted, the only drawback, that of slow service, would be removed. Talking the longest distances across Paris, the lines are noiseless, and the transmitters seem to speak out loud. The rental per instrument is $120 per annum.

The action of the Massachusetts legislature last week, following so quickly in the footsteps of those of Indiana and Illinois, have at last awakened the American Bell Company to the idea that the great American public are after them with a sharp stick. The fact that they have called a conference of their licensees, to be held in Boston next week, is the first sign of a slight bend in the back of the great monopoly, and a good many of their stockholders think it has come none too soon. It is understood that the Bell Company are making strenuous efforts to turn the tide a little more in their favor. It is hardly probable that the bill referred to in Massachusetts will become a law this year, as it has in the other two States mentioned; but it will surely come up again next year unless something is done to change public opinion. The hand of the Bell Company, as shown in the recent meetings of the New England Company, and in deliberately overthrowing men who have been connected with them from the start, and doing it in such a manner as to engender bitter feelings, which could easily have been avoided, will not make it any easier for them to mould popular opinion. That the telephone business was heartily supported and well spoken of by the public until within a year and a-half, no one will deny; and that it can be made so again there is no doubt, but not until the licensed companies of the Bell Company are treated differently than at present.

EXEUNT THE NEW ORLEANS FAIR.

The World's Exposition at New Orleans which has been known for its size rather than for its quality, is ended, and those who have not visited it and been subjected to its extortions and discomforts may perhaps be induced to drop a tear in honor of its memory.

As an exposition of woman's needle-work and high art achievement of the North Western territories it has been an unqualified success, but it illustrated American mechanical art as Mr. Solomon Isaacs of Chatham street presents the product of Broadway tailoring when he turns out the cloth of worn-out garments and makes a sinner of his memory by crediting his own lie as to their newness.

When Mr. Edison returned from the Exposition, some time ago, we asked him his opinion of it. We will not record that opinion here because it was not intended for publication. It consisted of a word of four letters much used in the leather trade.

But the Exhibition is now over, and thanks to a recent decision of the cabinet at Washington, Congress is not to be asked for any more money, in order that it may, later on, be revived. The gentlemen from Arizona can take back their iron ore, and the Philistines of New Mexico may weep over the remnants of their petrified forest. The first could not be induced to believe that a few tons of ore would clearly indicate the richness of Iron Mountain, but must needs bring the whole mountain with them, and the latter demanded the unbroken fastnesses of their native States even of that which once illustrated its condition at the remote epoch known as the Pliocene period. The last visitor, like his last shekel, has departed and all that remains having an air of the stranger is him who came for spiritual rather than for scientific pleasure. Among the desolation he is alone. He is the Peri disconsolate at the gate of Eden—a red-nosed and disreputable Peri, looking as if he has slept in his clothes, exhaling eleemosynary rum and without a spectral chance of getting his toes warm. But he must remain for he has not the wherewithal to get away.

THE AUTO-ACCUMULATOR.

Since the Jablochkoff lights were removed from the Avenue *de l'Opera* in Paris, its designer has not figured very prominently before the public, and though his ingenious light has often been referred to, its use, for economical reasons, has been extremely limited. We have from time to time heard, however, that M. Jablochkoff was working diligently at various problems in electrical science with more or less success, and if a recent invention of his shall fulfill the promises which have been made for it, it is likely that its construction will attain an enviable position in the domain of applied science. This apparatus, which was recently brought by M. Jablochkoff to the attention of the Society International des Electricians, is a combination of the primary battery and the electro-accumulator.

We learn from our contemporary, *Bulletin International des Telephones*, that this apparatus is based upon the following principle: If a battery is formed of a plate of metal easily oxidizable, iron or zinc, a porous lead or carbon plate and an acid, and the two poles are united by an exterior circuit of very feeble resistance, the porous plate will be rapidly polarized, and its potential becomes almost equal to that of the oxidizable metal. It produces there an action like that which is to be observed in the accumulators. The element to which he has given the name auto-accumulator is a sort of basin of paraffined carbon filled with iron or zinc filings, covered with a piece of linen saturated with common sea salt or with chloride of calcium —this last substance is preferable, by reason of its deliquescent properties. Finally a tube of very porous carbon is placed above all in order to give access to the air. In this way a number of points of contact are obtained between carbon and filings, these forming a series of miniature primary batteries in a closed circuit. Without going any further into the particulars of construction, it may be said that the apparatus is both original and ingenious. There are two essentials which must be proved that it possesses, before it can be looked upon as an economical or rather a commercial success, and these are, capacity for work and constancy of current.

THE ELECTRIC LIGHT FROM A SANITARY POINT OF VIEW.

In reports about the increasing uses of electric light, we meet often the expression that at certain localities, say 20 "burners are lit." This is a very erroneous statement, because an electric light does not burn at all. The principal difference between an electric and an ordinary light, whether it be produced by candles, lamps or gas, is that electric illumination does not involve the combustion of any material, consequently it does not deprive the atmosphere of its oxygen, while the other methods of illumination involve the feeding of the flame by combustion and consequent absorption of atmospheric oxygen, resulting in the necessary consequences of the production of various gases, the principal of which is carbonic acid, carbon being the main element of the substances used for feeding ordinary illuminating flames.

It is well known that the life of man has to be sustained by the continual absorption of oxygen, chiefly by the lungs, but also by the whole skin. The amount thus absorbed is 16 pounds per day, which being diluted with four times its amount of nitrogen, involves the consumption of 80 pounds of pure air every 24 hours, or more than 3 pounds per hour. Considering the small weight of air (which for the same bulk is some 1,000 times lighter than the human body), this is a large quantity, being some 300 gallons of pure air per hour, or five gallons every minute, of which a little over three gallons is respired by the lungs, and the balance by the skin, which takes a very active part in the elimination of effete gases from the system. The estimate here given is based on carefully conducted experiments, and is a striking proof of the importance of living in a pure atmosphere. It explains why a change of residence, even if only from one house to another, may involve important consequences in regard to the health of the inmates.

If now the continual consumption of pure oxygen is so important to the maintenance of health and life, it is evident that anything which tends to diminish the amount of oxygen present in the air, and to deteriorate the atmosphere in which we live and breathe, should be avoided.

We must next consider that experiments have also proved that every candle flame consumes as much oxygen as a man, and a lamp or gas flame from two to three time, as much, and that they throw the products of their combustion in the atmosphere. These products are, as stated above, chiefly carbonic acid, the same as exhaled by man, while, when lamps are imperfectly burning, the very injurious carbonous oxide may be produced, and other obnoxious gases, as every one knows who has ever experienced the odor of badly managed kerosene lamps. Common gas is often not free from sulphur, or other objectionable ingredients, throwing sulphurous and other vapors into the atmosphere.

Considering all this, it is evident that our common way of illumination, at the expense of the pure atmospheric oxygen, which we need for breathing purposes, is highly injudicious; and it is no wonder that when they have been applied in crowded localities, where not very active provisions were made for ventilation, injurious, if not fatal results have been experienced.

The electric light, contrary to the other methods of illumination, is produced by an agency outside of the localities which it illuminates. It is the combustion of the coal which heats the boilers, the steam generated drives the engine, which moves the dynamo-electric machine, and this generates the electric current, which ultimately produces the light. Combustion is also here the source of the light, but it takes place in a furnace, and the products of this combustion are not thrown into the locality to be illuminated, but at a great distance through a chimney into the free air, and the chain of different activities involved in the operation has for final result the total separation of this combustion and its flame, heat and smoke from the light-giving apparatus, while in the ordinary methods of lighting they are all united in the room to be lit.

It is true, that by the use of the electric arc, there is a slight consumption of the carbon points, but this is so very small as to be of no practical account, while with the use of the incandescent light, enclosed in a vacuum glass globe, there is no consumption of anything whatsoever, except, when by some accident to the glass globe, air acquires access, in which case the lamp commences to burn in reality, and its life is extinguished at once.

There is another consideration which is important as well in an economical as a sanitary point of view. In the combustion of gas, more than 95 per cent. of the latent energy is transformed into heat, and less than 5 per cent. into luminous rays, while in the case of electric light it is the reverse, more than 95 per cent. of the electric energy is transformed into light, and less than 5 per cent. into heat.

In the case of gas, the heat is diffused through air currents through the whole locality; if not, extraordinary measures have been taken to remove the products of combustion through expressly constructed channels, while in the case of electric light the much smaller quantity of heat is confined to a single spot, where, by its concentration, the temperature is much higher than that of any flame, but the confinement to the limited space prevents the diffusion of the heat, while that of the intense light is radiated freely.

The readiness with which we adopt im-

provements, such as electrical illumination for practical purposes, and the tardiness customary in this regard in Europe is illustrated by the two famous tunnels, the attempted tunnel under the Hudson River, New York, and the St. Gothard tunnel in Switzerland. In the first electric lights were used from the beginning, while in the St. Gothard tunnel oil lamps were used, and in such numbers, that according to the reports of visitors, the smoke was suffocating, and the heat 106° Fah. This is not to be wondered at, when we are informed that the number of men employed is 2,400, most of whom have a lamp each, while the daily consumption of oil is 150 gallons. More than 200 men have been killed by accidents, a greater number have been injured, while a still greater number succumbed or had to abandon the work, being compelled to do so for reason of the stifling heat and smoke-laden atmosphere. We consider it a criminal neglect not to use electrical illumination for an engineering work of this kind.

The electric light possesses two other advantages beyond the valuable one of not contaminating the atmosphere; it does not heat the air of the locality it illuminates, and the nature of the light is such as to be the most approximate to sunlight, indeed more than any other source of illumination known, which two points are also of importance in a sanitary point of view. Keeping the atmosphere cool in crowded localities, in place of adding to the heat by numerous flames, is surely beneficial, while when properly used and screened, the cool, pure and white electric light must necessarily be better for the eyes and for the whole system, than the yellow light produced by flames, while its beneficial effects in the growth of plants has been a subject of experiment, appears to promise favorable results when properly applied.

Its similarity to sun or daylight, which is decidedly the most beneficial of all illuminations, is also proved by the success of making photographic pictures at night, in London, Paris and New York, by means of electric light, which pictures are taken in as short a time as daylight pictures, while in regard to artistic effect of light and shadows they leave nothing to be desired, if only the illumination of the sitter is properly managed.

In regard to the objection sometimes made, that the glare of the electric light is unpleasant to the eyes when looked upon, we may answer that the solar brightness may be equally objected to, upon equal grounds. But nobody desires to stare at the sun; experience teaches us not to do so, and will do so in regard to electric light. Then this objection will disappear, in fact, it has now already ended.

GENERAL WESTERN NEWS.

The Western Union which has heretofore accommodated its customers by accepting due bills collectable on demand for charges, has at last come to the conclusion that spot cash is better than trust and growling in payment for services, and will abolish the due bill system on the first proximo.

Every now and then somebody invents a new connector for joining the terminals—making splices in line wire. Clamps of every conceivable shape, screws, eccentric clasps, and other ingenious devices for holding these ends in contact, the principal object accomplished being the prevention of disconnection by lateral strain.

Now, it is easy enough to do this, and in the case of a clothes line or a fence wire, breaking is the all-necessary trouble to guard against. But in an electrical conductor there are other considerations which are paramount to strength alone. Discontinuity of circuit may occur without any visible break in the line, and this form of trouble is no small cause of vexation and tribulation. Where the contact is not entirely severed, the difficulty of detection is still further increased. The causes for these defects in conductivity are too often traceable to the patent devices alluded to. The trouble is one of easy avoidauce, and is, of course, more common in outside work than that which is indoors, or protected from weather, and is the result of electrolytic action.

The joining piece, connector, or what not, is almost invariably of different metal from the wire proper, and one or the other of these is the more readily acted upon by moisture, gases or acids, held in solution in the atmosphere. At the point of contact of the two metals, the action spoken of induces a change of conductivity, introducing resistance by oxidation. In long service this chemical change may result in entirely cutting off either the connector or the wire.

The remedy for this state of things is perfect metallic contact at the time of construction—in other words, soldered joints everywhere, as far as this is possible.

It has been a prevalent custom with electric light companies to neglect this little precaution, in installing their plants, and serious difficulties intervene after a time in consequence. When the lines are constructed, every portion of the wire is in good condition, all splices and connections are bright, and show little resistance. Of course the plant under these circumstances will work to a charm, and please the purchaser, as well as the seller and constructor. Yet, after a few months of service the lights grow dim, the performance of the poor dynamo apparently being the cause.

There are cases where a fifty or sixty-light dynamo has been unable to maintain half its complement of lights in a satisfactory condition. When the matter came to be thoroughly investigated, the cause was shown to be in the resistance of the connectors and other imperfect joints. There are systems for which the inventor and the manufacturer claim that the difference between the conductivity of a No. 6 and No. 4 copper wire is a matter of supreme importance in failure or success, and yet a single poor connection in the circuit or lamp will many times overbalance the advantage of the larger wire in current-carrying capacity; and a collection of these imperfect joints will sometimes throw into the circuit an aggregate resistance equivalent to half the lamp capacity of the generator.

This is no fancy sketch, but a statement of facts based on actual experience. From the day when a plant is installed with unsoldered connections, the carrying capacity of the wire deteriorates slowly or more rapidly, in accordance with surrounding circumstances, but surely, in all cases, until a thorough overhauling and cleaning up becomes imperative to insure good performance.

The useful energy of a forty horse-power engine, when half its capacity for work is used up in friction and other waste, is a fair comparison to that of a fifty-light dynamo that will run but twenty-five lamps. The machines are both doing all the work for which they are intended; but in the one case friction, and in the other resistance, diverts the power from its legitimate duties, and indirectly encourages transgressions of the seventh commandment, disappointment, distrust, and despair.

In conversation a few days since, while speaking of time balls, apropos of the new Board of Trade clock, it was suggested that the noon gun arrangement in the garden of the Palais Royal, Paris—somewhat modified—would be the better method for giving a mid-day signal. The piece of ordnance alluded to is, or was, fired by means of a powerful burning glass placed in the meridian, in such a position as to set fire to the priming exactly at noon by sun time. The proposed improvement would explode the charge by electricity exactly at twelve o'clock, mean time.

The high winds prevailing hereabouts at all seasons of the year, would be an insuperable objection to this arrangement, inasmuch as clocks distant from the gun would necessarily be fast or slow, if set exactly by sound, when the recipients were to windward or leeward of the time source in a high wind—and in many cases the sound would be lost entirely, while with a visible signal the lapse of time would be almost inappreciable, and in all cases the same.

This brings to mind an early device in fire alarm apparatus. Years ago, one who is now a veteran in electrical experience, arranged a circuit by which push buttons were scattered through a western town, the circuit from these running to an electro-magnet and battery at the central station. Closing a button released a weight, which in its turn pulled the trigger, and fired off a shot-gun at the fire headquarters.

The story goes that possibly because the remedy was preventive as well as protective in its character, in the latter days of the system's existence, during many months of weary waiting there were no alarms in the quiet little city. It had almost come to be the belief of the department that there would be no more, when suddenly the caked and rusty charge went off one day, demolishing the entire outfit, gun, magnet, weight and string, and the "shot-gun fire alarm" system became a memory.

The State regulators at our Capitol called up the Telegraph bill last week for reconsideration, a quietus resulting in the shape of tabling the offensive little document. In Michigan, the bill to regulate telephone rentals was killed in the House by a vote of 43 to 23. In Ohio the matter was referred to a committee of investigation, who, after thoroughly canvassing the matter among subscribers, reported adversely on the bill, inasmuch as they could not discover any dissatisfaction among the patrons of the company.

As a matter of protection, and to legalize its action, the following circular has been issued to all Indiana subscribers, whose leases expire on the last of June:

CENTRAL UNION TELEPHONE COMPANY,
CHICAGO, May 20, 1885.

You will please take notice that this company avails itself of its privilege to terminate your telephone contract No. —, such termination to take effect on the 30th day of June, 1885.

This action is rendered necessary by recent legislation in Indiana and the uncertain future of the telephone business within that State. The course to be pursued by the company after the above date has not yet been determined, but it is hoped that your relation to the same as an esteemed customer will not be disturbed.

F. G. BEACH,
General Superintendent.

The question of the right of the Legislature to fix the price of telephonic service is now before the Indiana Supreme Court.

There is no end of difference of opinion and remark on the above circular, as evinced by the comments of the Indiana journals. It is treated scornfully, earnestly, jocosely. Among others, the South Bend *Tribune* suggests, that under the circumstances the solons of the State should read Matthew 20, 15, where there was difference of opinion as to the justness of the payments of the householder in settling with the laborers in the vineyard: "Is it not lawful for me to do what I will with mine own?"

Chicago.

The Consolidated Electric Light Company, owning the Sawyer-Man patents, has reorganized as follows: President, Col. Charles H. Banes, of Philadelphia; Vice-President, H. T. Garden, New York; Treasurer and General Manager, Henry C. Davis, of Philadelphia. Four new members have entered the Board and will take active part in the management, to wit: C. A. Coffin, Vice-President of the Thomson-Houston Electric Company; Charles H. Banes, Henry C. Davis and Hon. Thomas C. Platt, President U. S, Express Company.

It is evident that Messrs. Geary & Morrill will do some effective work for the Fuller-Wood Electric Light Company during the present season, if good business management and enterprise count for anything in connection with a good system.

SOUTH-WESTERN NOTES.

Matters telephonic and electrical are quiet and uneventful down this way. There is little to chronicle at all new or interesting. We have been doing some considerable work in Little Rock removing wires from house-tops, last winter's experience with wires on roofs having been sufficient for all purposes. We are also exchanging the Edison transmitters in use here for Blake's.

This change has developed one thing; that is, it takes a better and stronger battery to work the Blake than an Edison. The last, properly adjusted and in good order, is the best and strongest talker. But for the (at times) disagreeable necessity of putting the mouth so close, and the liability of the cord and arm to work loose and give trouble, it is much the best in every way.

This company's exchange at Fort Smith, Ark., under the management of Mr. George Tiller, seems to be doing finely, judging from a new list of subscribers received lately. They have opened a branch office at Van Buren, five miles from town, and on the opposite side of the river, with seventeen subscribers, and have territorial connection with eleven other small towns.

Pine Bluff (Ark.) Exchange, Mr. Frank T. Crosson, manager, is growing quite fast. This exchange was opened one year ago, April 1st, and a new list, just received, shows 103 names.

Hot Springs, Ark., is a hot-water town, and, of course, the telephone manager, Mr. James Chambers, is liable to be in—Hot Springs. This is a watering place, and the patronage is about equally divided between hotels and saloons. (The hot water is good for toddies.) At the fall election the temperance people stole a march on the saloons and voted "no license," the result being about thirty saloons were closed, and the exchange lost that many subscribers. But they have had a new deal now: the saloons are on top again, and the telephones are going back in.

The last Arkansaw Legislature got in a little work on the telephone, but by good luck nothing very damaging. They were a representative lot this year—from the mountains, the backwoods and the cane-brakes—long-haired, and with a fine taste for navy plug and whiskey. Of course, they knew all about the telephone and railroad business, and there is no telling what they might have done had they tackled the subject earlier in the session. Fortunately, they had to elect two Senators this time, and that, with the repeal of nearly every section of the last digest of State laws just published, kept them occupied. It was only when the last much-abused book was completely exhausted that they turned their attention to "monopolies," and proceeded to "go for" the railroads and telephone. We got off cheap, but the railroads caught it. They actually proposed at one time to tax them upon the *cost* of "fills," cuts, tunnels, bridges, etc.

What kind of an idea would it be for some of the practical inspectors and managers throughout the country to write up a little of their experience with magneto bells — the troubles and peculiarities different styles display, with a few notes on batteries, etc.? Perhaps we could all learn something by comparing notes in the columns of the REVIEW?

A. F. A.

It is hinted by some of the stockholders of the Erie Telephone Co. that it might be a wise plan to take such steps at the annual meeting next week as will lead to the placing of competent officers in charge of their business who will at least consider the interests of the company of as much or more importance than their own personal schemes and malicious designs.

From all accounts the company's business is sadly in need of the attention of practical and thoroughly competent telephone men.

Telephonic News

*** And now comes Freeman with a telephone that is operated by "pulsations" caused by the opening and closing of the circuit!

*** The $3 per month telephone rental bill has been introduced in the Massachusetts legislature by a vote of 81 to 60. The bill is now on the calendar.

*** The Governor of Massachusetts has signed the bill which compels telephone companies to forego all discrimination between persons desiring to use the telephone.

*** There are 379 telephone subscribers at Galveston, Texas, and 375 at San Antonio in the same State. If cotton pans out well down that way this year, the telephone people look for decided gains in telephone business.

*** The leading telephone men of the United States are *en route* to Boston, several having honored the REVIEW office with a pleasant call. It is evident that the Boston meeting has assumed larger proportions than was at first anticipated.

*** The Cumberland Telephone Company give notice to its subscribers terminating all contracts in Indiana. They say this is the only way to protect themselves in case the new law regulating prices to be charged for telephones is enforced.

*** The National Bell Telephone Co. has just finished the construction of a new line in Scotland, connecting the system of Glasgow with the small towns of Coatbridge and Mossend. The company already counts 11 subscribers in Coatbridge, and service is given day and night.

*** The chairman of the committee on corporations, Pennsylvania Legislature, is undecided as to when he shall call the committee together to consider the underground wire bill. Representatives of the Western Union Telegraph, Bell Telephone, and the Brush Electric Light Companies have telegraphed their desire to be heard by the committee in opposition to this bill.

*** The notice to telephone subscribers in Indiana, sent out by the Central Union Company, in which notice is given that contracts will terminate June 30th, is supposed to mean the thirty days' notice provided for in the company contracts with subscribers, so as to guard against contingencies. Should the telephone company shut down the exchanges when the law reducing the rentals goes into effect, they can do it without being subjected to numerous damage suits for failure to perform the service contracted for.

*** Some feeling was aroused by statements that the telegraph and telephone wires prevented the putting up of ladders in time to save life at the recent fire in West Sixth street, Cincinnati, and at a meeting of socialists, one of the speakers favored giving the companies thirty days to put the wires under ground, and offered to lead a crowd to cut down the poles if it was not done. However, when the facts were disclosed it was shown that the wires did not interfere at all. The chief fire engineer, Wisby, says the lost lives could not have been saved by ladders if there had been no wires in the street.

*** Manager Metzgar, of the Central District and Printing Telegraph Company, Pittsburg, closed contracts for putting underground 250 miles of the wires of that company. The cables will be placed in all the principal streets first, but the work will not be commenced until the bill pending at Harrisburgh is disposed of. The wires will be laid in cables of seven wires or more, each wire surrounded with cotton as an insulator, and the whole enclosed in a leaden tube. The Standard Underground Cable company got 150 miles of the contract, and the Western Electric Company, of Chicago, 100 miles. The amount involved in the contracts aggregates about $35,000.

*** The following is a statement of the business of the New England Telephone and Telegraph Company for the month of March: Gross earnings, $77,689.02; gross expenses, $52,285.80; net earnings, $25,403.22. There was expended for construction during the month the sum of $8,358.80.

*** Senator Don Cameron claims to be one of the thousands of men who might have made a fortune in Bell Telephones if they had only taken the opportunity. He told a friend recently that Professor Bell once offered him a controlling interest in the stock for $60,000. Cameron says he believed in the enterprise, but couldn't well spare the money at the time.

*** On the 23d of April the number of subscribers of the Societe generale des Telephones of France was 5,729, as against 5,584 to the 1st of January last, which represents an increase of 145 subscribers. The Societe Generale des Telephones operates in Paris, Alger, Bordeaux, Havre, Lyon, Marseilles, Nantes, Oran, Rouen, and Saint Pierre-les-Calais. The number of lines in service is actually 5,641, of which 3,722 are in Paris.

*** The following is the statement of the income, expenses, and surplus of the Central Union Telephone Company for the three months from January 1 to March 31, 1885:

Income from all sources	$228,595.29
Total expenses, including reconstruction	152,175.51
Net earnings for the quarter	$76,419 78
Amount required to pay 1½ per cent. dividend (paid April 25).	64,401.00
Surplus	$12,018.78
Add surplus, as shown by last report	276,435.61
Total surplus earnings, expended in construction to March 31, 1885	$288,454.39
Total cost of construction during the quarter	$13,563.82

*** The following statement by Treasurer Chapman, of the Central Union Telephone Company, speaks well for the excellent management of this company, and Messrs. Louderback and Beach are to be complimented on the excellent results attained:

	Year ending Dec. 31, 1882.	Year ending Dec. 31, 1883.	Year ending Dec. 31, 1884.
Exchange income and expense.			
Annual income at the rate of	$482,053.44	$662,431.45	$751,948.45
Total expense, including reconstruction	339,314.17	517,490.53	535,644.59
Toll line income and expense.			
Total income for the year	29,602.04	147,395.39	201,883.32
Total expenses, including reconstruction	5,649.38	69,453.91	106,668.91
Private line income and expense.			
Total income for the year	4,842.82	6,420.91	5,208.74
Total expenses for the year	1,050.00	1,696.16	696.10
Recapitulation.			
Total income, all sources	516,498.30	816,247.73	959,040.51
Total expenses and reconstruction	346,013.55	588,640.60	643,009.60
Net income	$170,484.75	$227,607.13	$316,030.91
Total cost of construction.			
At exchanges for the year	$322,171.77	$322,419.95	$53,448.05
Of toll lines	189,748.80	407,383.23	49 926.18
Number of exchanges open	112	166	140
Number of subscribers therein.	12,750	16,726	16,750
Miles of toll wire in operation	2,553	8,847	9,697

There has been applied to the acquiring of additional property to December 31, 1884, $276,435.00 of surplus earnings.

Dividend-bearing capital stock outstanding Dec. 31, 1884	$4,293,400
Number of stockholders, Dec. 31, 1884	583

The Telephone Service at Minneapolis, Minn.

The REVIEW is familiar with the difficulties to be met with in giving satisfactory telephone service, particularly in large exchanges; and, as a rule, attaches but little weight to the unreasonable complaints that are heard wherever a telephone is used. We have often found, also, that criticism by the daily press is often the result of a single individual's trouble—and that individual one possessing the vantage ground of access to the press as a mouthpiece—and does not represent public opinion or the true state of affairs. Besides, there are a number of bright paragraphers who must have something to write about, and the telephone is a gold mine to them, inexhaustible and varied. It is with all these considerations that we approach the question of telephone service in Minneapolis, Minn., from which point, for months past, complaint after complaint has reached this office. There are exceptions to all rules, and this seems to be an exception. That there is something decidedly wrong with the present management, we are convinced; that it will be remedied as promptly as possible we sincerely hope. If the officers of the Erie Company have permitted the telephone service to reach a condition as unsatisfactory as is stated to us, and as appears from the daily press of Minneapolis and St. Paul, they will find it a long and tedious task to reconstruct the exchanges, and again deserve the confidence and patronage of the Minneapolis public granted the former management. Interviews with the business men of the city, though not always reliable, would indicate the dissatisfaction to be wide-spread and almost universal.

In the *Tribune* of May 21st is given an account of the meeting of Manager J. P. McKinstry, of the telephone company, with a number of citizens of Minneapolis, from which we extract the matter given below:

Mr. McKinstry welcomed the guests, and conducted them through the "central," showing to them the intricacies, and allowing them to see with the naked eye the devoted heads of the young ladies, on which they have been for the past few months showering down curses by wire. Several of the visitors were apparently deeply moved by the struggles of the young ladies to handle three pins and a stick in one hand, while they held the 'phones with the other and whispered gently into the receivers. All sentiment, however, was laid aside when they had come out of the central office, and the remainder of the evening was taken up with a cold-blooded discussion of why the company charged full rates and gave half service.

The rules governing the exchange were then read, the subscribers asking questions quite freely. These brought out the statement that the girls work, on an average, nine hours a day; that, as a rule, the work agrees with them, though it is especially tedious and wearing to a nervous person; that subscribers frequently swear at the girls, because of some break in the machinery, unknown to the operators; that the ear telephone had been tried and found unsatisfactory; that there are 1,050 subscribers and ten operators in Minneapolis; that there are 640 subscribers in St. Paul and eleven operators; that one girl had been discharged a week ago for telling a subscriber to "say please;" that the subscriber's mouth should be held from three to six inches from the receiver; that an ordinary tone of voice was the proper one; that transmitters adjusted for some voices would not work with others; that in case of trouble it was best to send for a man from the office.

"Why is it," asked Capt. D. M. Gilmore, "that when this man is sent for, it is usually from two days to three weeks before he comes?"

'That I cannot explain," said Mr. McKinstry. "I think either the order was mislaid or that it was before my connection with this exchange."

Further questioning brought out statements that all troubles should be reported to "No. 400;" that many troubles reported did not need a visit of a lineman to the subscriber's office; that Mr. McKinstry had been connected with the Minneapolis exchange only three or four months; that he was the manager for a considerable section of western country; that he had been at Pierre, Dak., on business for the company, a considerable time since coming here; that he had been connected with the telephone business since it was given to the public; that he had been connected with the telegraph for twenty years previous, and knew his business; that he was the one to whom complaints should be made, and some other points of minor interest.

"Speaking of the system of wires which seems to interest the *Tribune*," continued Mr. McKinstry, "there are in this city 232 special lines, 98 lines that have two subscribers, 85 with three subscribers, 65 with four, 11 with five, and 1 with six."

After listening to statements and questions, Mr. D. Blakely rather sized up the object of the meeting by saying: "Now, what we want to know is if we are going to get any better service than we have been having. I don't believe there is any proper head to this office—any person that makes it a matter of business to see that the operators attend to their duties. In Indianapolis the same general system is used as here. There they have more operators for the same number of subscribers, a superintendent, manager, and one or two monitors to look after the interests of subscribers. Now, we want to know if, by expending a few dollars, we could not have a better service than we have at present? I don't believe this is a question of 'induction;' it is a question of slow service."

"I have been here but a short time," said Mr. McKinstry, "and during the past few weeks we have been unable to give satisfaction, owing to the repairs at the City Hall.

"And yet, although you have been able to give but half service, I have heard nothing said about half pay," remarked Capt. D. M. Gilmore. As to whether or not we ever had good service, is a matter of opinion. I don't take the word of any superintendent for half so much as I do my own experience with the 'phone."

"If there are complaints, they should be brought to headquarters," said Mr. McKinstry.

"Who is the proper person to make complaints to?" asked Mr. Blakely."

"I am;" answered Mr. McKinstry.

"Suppose you are at Pierre?"

"They should then be taken to Mr. Palmer, the next man in authority," said Mr. McKinstry.

"Is he always in the city?" queried Mr. Blakely.

"Well—no; his family is in St. Paul, and he is there most of the time," replied Mr. McKinstry.

"But we can't stop to take the train and go down there every time the 'phone won't work," interposed Captain Gilmore.

"But he has a 'phone right at his desk, and can always be reached," was the answer.

"But we can't talk between here and St. Paul. As you just explained, there is too much induction," continued Mr. Blakely.

"Oh! yes, you can nearly always reach the superintendent."

"But you just said that there were times when it was almost impossible," insisted Mr. Blakely.

"But I said I had remedied the trouble largely, and all complaint should at once be reported to him, if I am not here."

"Lord! The subscribers would get tired to death coming down to see whether you were here or not," said a voice.

"I want to say that I am very well satisfied with the service," said some one in the rear of the room.

"Thank you very much," said Mr. McKinstry.

Mr. McKinstry then said that he was doing what he could to improve the system. He had had experience and thought it would count. He had come here to stay and should soon send for his family.

"We don't care who you are or who the company is, if we can only get a better service," said Mr. Blakely. "I think that it has been shown here that the force is about 20 per cent. less than that employed in Indianapolis. There seems to be no manager here except Mr. Palmer, who is at St. Paul, and we can't go there with every little trouble. If you can bring about a system that is better than the one that we now have, you are a man we shall feel like taking to our bosoms. Just go in and improve our service and we will all rise up and call you blessed."

BY THE ELECTRICAL EDITOR OF THE MINNEAPOLIS TRIBUNE.

We append a few telephone paragraphs, to be taken with allowance; but some of them are too good to lose and evidently have excellent grounds for their publication:

While our telephone manager is galloping over the wide, wide world, the Minneapolis system is allowed to run itself, and subscribers can take what they get or go without.

Induction was so very bad yesterday that four wires melted and ran together. No trouble was noticed in other towns in this vicinity; but then, you know, it's the latitude.

According to the new version of the Old Testament we must shout "sheol-lo!" when attempting to use the telephone, and simply mutter "sheol" when the attempt is followed by the usual result.

We live in the great induction belt. It extends from the *Tribune* office to the central telephone office in width, and from the northern to the southern limits of the city in length. New facts in the science of electricity are being discovered every day.

So perfect is this [Indianapolis] system that there is an average of but fifteen complaints daily to 1,000 subscribers, remedied in as many minutes. In Minneapolis the re-

verse is the case—1,000 complaints to every fifteen subscribers, remedied in as many hours.

An exchange says that down in Maine they have the telephone system so perfected that subscribers in, Bangor converse easily with those in Portsmouth. This news may make Minneapolis discontented, but we feel that they should know of the progress that this invention has made of late years. In many cities the telephone is used as a common means of communication, and we have even heard of cases where the system was so perfect that telephones were of frequent use in families for giving orders to grocery and provision stores, livery stables, etc. This information will doubtless cause a great deal of surprise, but nevertheless it is absolutely true.

There at the telephone, blithe and gay,
A young man shouted "What! Central, I say!"
And the trembling wires with shuddering bore
The rings, like the rings at a debtor's door,
A terrible jangle and clangor and roar;
But never an answer, which vexed him sore;—
For "Central" was only a block away!
* * * * *
Still at the telephone, old and gray,
He rang and he shouted, from day to day,
He jumped and clamored; he rang and he swore
As mortal has never (or hardly) before!
But still there was silence, a giggle or two,
Was all that he heard and his anger grew
For "Central" was only a block away!
* * * * *
Into the room they forced their way
(Ten years had passed, I may as well say)
And there was a horrible sight before,
A sight for the ages themselves to deplore!
A skeleton stood by the telephone;
The receiver was clutched in its hands of bone;
Its crumbling skull to the box was pressed;
A paper, with writing, was pinned on its breast;—
"Yet Central is only a block away!"

Annual Report of the Southern New England Telephone Company.

We give the report of President Tyler in full, and all our readers in the telephone field will find it of interest.

To the Stockholders of the Southern New England Telephone Company:

Your board of directors have the honor to submit their annual report as follows:

The treasurer's statement in the form of a summary balance sheet is as follows:

Capital stock		$1,500,000.00
Surplus		201,773.34
Contingent		378.01
Profit and loss		10,465.30
Bills payable		54,312.32
Quarterly income		63,480.10
Sundry accounts		36,020.23
		$1,866,429.30
Cash and bank	$4,606.19	
Bills receivable	75.00	
Disbursements—cash	402.62	
Franchise	525.000.00	
Treasurer, Trustee.	40,840.00	
Sundry expenses	49,296.47	
Unpaid earnings	4,050.62	
Personal property.	3,254.35	
Supply	7,253.71	
Sundry divisions, inc.	9,920.10	
Sundry divisions, plant	1,219,512.09	
Sundry accounts	2,218.15	
		$1,866.429.30

The cash assets and liabilities of the company, March 31, 1885, were as follows:

Cash	$4,606.19	
Bills receivable	75.00	
Disbursements	402.62	
Personal property.	3,254.35	
Supply	7,253.71	
Sundry accounts	2,218.15	
Back dues	15,798.06	
American Bell Telephone Co. for lines	35,000.00	
Lines westerly to Providence	6,900.00	
		$75,508.08
Bills payable	$54,312.32	
Sundry account	36,051.13	
		$90,363.45
Balance		$14,855.37

As against this net liability of $14,855.37, there was available in the hands of the treasurer on the 31st of March unissued stock to the amount of $40,800.

The year that has just closed is the first in the history of our business which has failed to show a very marked growth. Our receipts are in excess of those of the year 1883–84 by some $30,000, but the amount of current business at the end of the year does not show any material change from a year ago. On March 31, 1884, we had 5,615 stations, and on April 1, 1885, we had 5,634, an increase of 19. But the year has shown for the first time what may be called the fluctuation of subscribers for the twelvemonth. Between April 1, 1884, and April 1, 1885, our figures have ranged from 5,826 on the 1st of July, 1884, to 5,561 on the 1st of February, 1885, a variation of 265. There is every reason to believe that the coming year will show a similar rise and fall of our list, leaving us at the end of the year in substantially the same position as now.

It is worthy of note that, while the increase of stations has been only nineteen, yet we find a net gain of thirty paying stations. The figures of 1884 were made up of 5,465 paying subscribers, 47 Western Union stations, and 103 deadheads. The figures of 1885 are made up of 5,495 paying subscribers, 46 Western Union stations, and 93, or ten less, deadheads.

Another fact which calls for notice is this, that to obtain this gain of thirty we have this year handled 2,328 sets of instruments. We have removed 1,149 instruments, and placed 1,179, showing that of our entire custom there has been a change in about one-fifth during the year.

And once again, when we analyze the places in which we gain and lose, we find that of the fourteen exchanges numbering over 100, which we are working to-day, all but three are larger than they were a year ago, while of the nineteen exchanges of less than one hundred, all but six are smaller than they were in April, 1884.

The gradual development of these facts has caused your board of directors to make some material changes in the financial administration of the company. We are convinced that we are now at the period when we must look to our current earnings to pay for all expenditures of every kind whatsoever. The system, as now established, must not only maintain itself, but must provide for the ordinary extensions and improvements which the growth of population and business and the development of improved apparatus may demand. It is true that the past year has been one of financial depression and embarrassment, but we do not see that our loss of paying subscribers has been so largely due to that cause as to the regular recurrence of reasons for change that must always be found among 5,500 people. "Removal," "Death," "Closed up business," and such reasons, are vastly more frequent causes given for the discontinuance of a station than "Can't afford it." With these facts in view we have turned our attention to reducing the charges to construction, and to cutting down our fixed expenses, and studying the economies of the business wherever we have found it possible. The following statement of the charges to construction for the successive quarters of the fiscal year will show what has been effected in this direction:

Charge to construction for the quarter ending June 30, 1884	$19,570.71
Charge to construction for the quarter ending Sept. 30, 1884	16,058.98
Charge to construction for the quarter ending Dec. 31, 1884	12,545.51
Charge to construction for the quarter ending Mar. 31, 1885	4,392.96
	$52,568.16

We may note in passing that the charges to construction for the month of April, the first month of the current year, were only $837. This action is in the direction of determining profits only after deducting both the construction and expenses for a quarter. It seems to us that the business is now in such a condition, and is so far developed, that this is the only safe and conservative method of determining our real profits. Of the construction account given above, $34,426.70 has been expended in exchange construction, $18,141.46 has been expended in extra-territorial construction.

It follows as a natural consequence from the adoption of such a policy that we must either entirely stop construction or must increase our income in order to maintain the same ratio of earnings. The decrease in the amount of net earnings which the last year shows, when compared with the year preceding, we may say to be wholly due to the fact that we have charged into expenses items which, when the business of the company was steadily growing, were legitimately charged to construction. That condition of things having ceased, and the earning capacity of the company no longer keeping pace with the demands for such expenditures, the result has been to reduce the balance of profit left in our hands after keeping our plant in proper condition. When we consider the fact that during the year we have established and equipped 1,179 new stations, and yet that the net result has been a gain of only thirty, it is evident that we are at that point where the expense incident to the establishment of such new stations can be regarded only as a running or maintenance expense.

This fact has led us to consider very seriously the question of the prices charged by this company for its service. In comparing our prices with those charged by other companies, we find that we are very much below the average, and the experience of the year has shown us also that we are below what the expenses of the business legitimately demand. We have, consequently, during the past year, made two changes in prices in the direction of increase. On the 1st of June we decided to take no more orders for instruments at $30 and $40, but that hereafter they should be at $35 and $45; and in February we made a still further advance, and instructions were given to our managers to take no more orders except at a general advance of from thirty-three to twenty-five per cent. upon the old prices. Owing to this action we find that though there has been for the last six months a net loss of one hundred subscribers, the current income on the 1st of April for the quarter does not vary materially from the current income on the 1st of October last for that quarter, and when we consider the saving in expense which arises from the deduction of the royalties which would have to be paid on the instruments used at those one hundred stations, we find a net balance in favor of the company on a smaller number of subscribers. In time this increase of prices upon new orders would substantially raise the prices of all subscribers, but meanwhile the earnings of the company would not be what the stockholders have a right to expect.

We have also to consider that after the 1st of January, 1886, the earnings of the company must be adapted not to $975,000 of stock, but to $1,500,000 of capital stock. We shall be obliged to pay as one of the expenses of the business, thirty-five per cent. of our net earnings to the American Bell Telephone Company, who have furnished no cash capital; and again, our expenses will at that time be increased still further by a slight increase in the average amount of royalty which we shall have to pay. These items are legitimately part of the expenses of the business, which we have contracted to pay for the right to do business, and our charges must be made with a view to meeting them and still leaving a fair profit for the holders of that portion of the stock which represents the money that has built our plant.

A reference to the treasurer's statement will show that the net earnings of the company for the year have been $73,480.32, which is at the rate of 7½ per cent. upon the capital stock drawing dividends. We have not declared the whole of these net earnings in dividends for reasons evident to any business man. Three of the dividends which we have paid have been paid in the stock of the company, and for this very simple reason: the corporation, trusting to its ability to use the unissued stock still in the treasury, incurred for construction account a considerable amount of indebtedness; but when we came to the point where we were ready to use this stock, the general business outlook had so seriously changed that we were not able to put it upon the general market at the prices for which we were authorized to sell it. We did not deem it good judgment to go on any longer carrying so large an indebtedness. It had to be carried largely upon individual credit, which was loaned the company without security, and we felt it was only justice to our endorsers to begin a policy of reduction. We felt, on the other hand, that it was due our stockholders that they should receive something to represent the profits of their property so long as there was anything in our hands to distribute to them. We have consequently issued this stock as representing that for which the money was expended, the plant of the corporation. The statement which we have given of the cash assets and liabilities of the corporation is such as to lead us to hope that this course is near its end, and that the stockholders will soon receive the profits of the company in their most acceptable form, that is, cash; but we are desirous of conducting our business on thoroughly conservative and safe principles, and it is this desire alone which has governed our actions in the matter of dividends. The increase of prices and the reduction of expenses, both of which we hope to put in operation this season, we anticipate will put the company in such position as to show net earnings equivalent to at least six per cent. upon our whole capital at such time as the American Bell Telephone Company participates in our dividends.

For the Directors,
MORRIS F. TYLER, President.

TREASURER'S STATEMENT.

April 1, 1884, *to April* 1, 1885.

Earnings	$258,255.07	
Expenses	184,774.75	
		$73,480.32

DISPOSITION OF NET EARNINGS.

Dividends	$59,465.50
Surplus	549.52
Contingent	3,000.00
Profit and loss	10,465.30
	$73,480.32

COMPARATIVE STATEMENT OF RENTAL AND EXTRA-TERRITORIAL ACCOUNTS OF APRIL QUARTER, 1884 AND 1885.

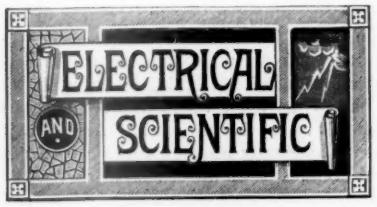
Rentals	$52,153.27	Rentals	$54,754.64
Rentals, back due	8,206.24	Rentals, back due	8,357.05
	$60,359.51		$63,111.69
Ex.-territorial.	$7,087.05	Ex.-territorial	$6,887.60
Ex.-ter. back due	1,391.10	Ex.-ter. back due	688.95
	$8,478.15		$7,576.56
Plants, April 1, 1885			$1,219,512.09
Plants, April 1, 1884			1,166,943 93
			$52,568.16
Construction for quarter ending June 30, 1884			$19,570.71
Construction for quarter ending Sept. 30, 1884			16,058.98
Construction for quarter ending Dec. 31, 1884			12,545.51
Construction for quarter ending Mar. 31, 1885			4,392.96
			$52,568.16
Exchanges, Apr., '84.	36	Stations, Apr., '85	5634
" " '85.	33	" " '84	5615
Decrease	3	Increase	19

Since October 1, 1884, our books have been kept in a way to enable us to determine the various items of expense, and for illustration of the demands of the service, we append an analysis of the expense account for the six months from 1st October, 1884, to 31st March, 1885.

INSTRUMENT RENTAL.

Oct., Nov., Dec., Jan., Feb., Mar.	$34,128.59
Operating and pay-roll	38,064.84
General expense	900.92
Livery	1,649.94
Damage and compensation	195.00
Railroad	102.77
Board	39.75
Postage and stationery	580.20
Rents	3,136.36
Repairs and maintenance	15,889.65
Reconstruction	43.04
Miscellaneous	290.16
	$94,951.22

A. H. EMBLER, Treasurer.



* * The United States Patent Office did a larger business during April than it ever did in any previous month. The applications for patents were 3,159, and the fees $100,640.

* * A new process for drying lumber is attracting attention. It consists in surrounding the wood with common salt. In ordinary kiln-drying the albumen is killed or destroyed, and the surface dies out first, thus sealing the juices inside to escape eventually through cracks caused by the uneven expansion of the wood. The new process is said to be better in this respect.

* * An unprecedented amount of uninvested capital is now lying in the banks throughout the country, the result of the unsatisfactory condition of industry. In New York City alone the bank deposits are $50,000,000 greater than they were a year ago, and the banks are loaning $28,000,000 less, making the actual increase of unemployed capital $78,000,000. The surplus reserve in the New York banks over legal requirements is now $57,416,050, as against £3,127,055 in 1884.

* * An astronomer gives us an idea of the relative weight of the sun and the earth, as follows: "Let us, to start with, weigh the sun. Suppose we have a balance gigantic enough for the purpose, and the sun is resting on one of the scales. Now, put the earth in the opposite scale. You might as well weigh your head against one of the towers of the East River bridge. Pile a hundred thousand earth's into the balance, and the sun does not stir. There lies the colossus immovable. But get together another hundred thousand, and then another hundred thousand, and stack them up in the pan against the sun. Three hundred thousand worlds piled up on one side of the balance and still the sun keeps them up. It would take 30,000 more, or 330,000 earths, to move the beam even against a single sun, and six sextillions is the number representing the weight of the earth in tons—a mass which is shooting through space at the rate of eighteen miles in a second."

* * There has been considerable interest taken in the Clapp-Griffiths steel process of late. This has been caused by the probability that it will not only successfully antagonize the Bessemer steel process, but that it will revolutionize the whole iron trade. From eleven to fourteen Clapp-Griffiths steel plants have already been licensed, and the significance of this is that but few puddlers will be needed, their work being done by machinery. The product is a steel very low in carbon "which can be worked and welded as easily as the softest iron." Competent opinion has declared that this process will successfully rival the Bessemer process. One great advantage will be that of utilizing the high-phosphorus ores of the Lake Superior regions at better prices. The Bessemer ore men "will suffer," but the decrease of consumption of that variety will not equal the increased consumption of all. It will probably check the importation of iron ores. Iron men from the South and from the Northwest have investigated the process, and appear to regard it favorably. Its adoption will mean a genuine revolution. Ores high in phosphorus, heretofore of no use, will be available. Puddling will be largely done away with. Some considerable quantity of labor will be displaced, but in the long run the greatest good of the greatest number will be subserved. In response to interviews by *Bradstreet's* of authorities among the iron and steel trades at Pittsburgh, telegraphic replies as to the prospects of the new process are as follows: "Authorities here say that Pittsburgh will not be slow to recognize the value of the improvement, which is considered superior to anything yet discovered in the iron line."

* * The New York, Lake Erie & Western has ordered electric headlights for eight of its locomotives.

* * Scientific men are pretty sure to be above the average in point of morality; they have dedicated themselves to a high calling, they are elevated by its pursuit, they are free from the more violent passions, and removed from the coarser temptations.—*Goldwin Smith.*

* * The Curt battery, illustrated in a recent issue of the REVIEW, is most highly appreciated by the practitioners and schools and colleges. Mr. Meyer, the inventor and manufacturer, is receiving many orders since his announcement that he was prepared to furnish the battery.

* * It is conceded that the Lick telescope, when completed, will be the largest instrument of the kind in the world. It is understood that the lenses have been successfully cast, and only need polishing to be ready for use. In looking through this telescope it is reckoned that the moon will be brought within thirty miles of the earth, and that discoveries will be made on that planet to solve problems that have heretofore been held to be unsolvable.

* * M. Radiguet has invented a new form of the bichromate of potash cell, which permits of the zincs being lifted out and the two solutions of the battery isolated from each other by a single and simple operation. The Carpentier cell, working with a single solution of bichromate and generating a constant current of 1.5 ampere, is giving great satisfaction. This cell, as is well known, owes its constancy to the fact that circulation of the liquid is kept up.

* * At an invitation of a foreign government, says a London paper, Mr. Reckenzaun, who has done much for the application of storage batteries to tram-car locomotion, has produced designs for a torpedo service launch, to be propelled at high speed by electricity. The conditions enjoined are that this craft should make a voyage across the English channel and back in moderately fair weather. It is confidently believed that the test can be complied with, and the construction of the vessel and machinery is to begin without delay. In view of important improvements in the electrical appliances, the speed may be expected to exceed anything hitherto attempted.

* * Lieutenant Zalinski, of the Fifth United States Artillery, is a torpedo expert. He claims that our system of submarine torpedoes is the finest in the world, but that it is not a sure means of defence. He would agree to sweep a pathway through all the torpedoes that might be put in Sandy Hook channel, by arranging a counter mine of torpedoes down to clean them out. Start down say three turtle-backed propellers, drawing a line of floats one-half mile long, detached, and governed by an electric wire. From the floats he would suspend torpedoes in such a position that the radii of effectiveness of their explosions would destroy anything placed on the bottom or floating. In a short time a channel could be cleared out in this manner, so that a ship could pass up in safety. Shooting torpedoes are unreliable and can easily be guarded against.

Jablochkoff's Auto-Accumulator.

The well-known inventor of the electric candle has recently made public another interesting and ingenious invention. Several months ago we described in this journal his sodium battery, which it will be remembered was remarkable for its high electromotive force. The arrangement had only one fundamental fault, but it was a somewhat serious one—the rapid oxidation of the sodium in contact with the air. This drawback could be overcome by immersing the battery in naphtha when it was not in use, but this precaution gave rise to many inconveniences. The new battery is a development of the old idea, and possesses features of remarkable originality. The principal features of the present Jablochkoff cell, which has three electrodes, and which the inventor calls the auto accumulator, are its lightness, its low cost, the absence of liquids and of smell—qualities seldom found combined in any battery. The following will explain its construction and mode of working:

In a leaden vessel of any form are placed fragments of metals, such as iron, zinc, etc. Under the influence of humidity, this will form a couple, and the lead will be polarized. If above these metallic fragments, is placed a semi-conductive material, well moistened, such as sawdust, cloth, etc., and if over this, are sticks of charcoal, made very porous so as to give free access to the air, a current will be produced, when the leaden recipient and the carbons are placed in circuit. In this way a cell is formed with three electrodes, one of which oxidizes, a second becomes polarized, and the third forms positive pole with the second, the two first forming a couple with a constantly closed circuit. This general description will be clearer if we describe how M. Jablochkoff practically connects the cells. Several methods have been devised, the most ingenious and practical of which is as follows: A small rectangular vessel, measuring 4 inches on each side, is formed of carbon, which is impregnated with paraffin to prevent the air from penetrating, and producing polarization. In this vessel are placed a number of metal fragments—zinc clippings, pieces of iron, etc. On these is laid a thickness of wood sawdust, or a piece of coarse cloth impregnated with a solution of chloride of calcium, which maintains a constant humidity. Lastly, on this are placed, parallel to each other, eight hollow sticks of carbon. The whole forms a cell 4 inches square, and about 1 inch high. Any desired number of these cells can be coupled by piling them one on top of another between four guides, in the same way as a Volta pile. The bottom cell rests on a metal plate, forming one of the poles. The top cell is covered with a plate of carbon to which a terminal is fixed, and this forms the other pole. As will be seen by this arrangement, the lead is replaced by carbon, which makes the cell lighter, and more easily cleaned. This latter operation is very simple, and is effected by washing the cell in water, so as to remove the metallic chloride formed, and plunging it afterwards in a bath of chloride of calcium, when, after drying, the cell will remain fit for work during 24 hours. We have said that this auto-accumulator will work with any oxidizable metal. In practice M. Jablochkoff has confined himself to three principal bodies—iron, zinc, and amalgam of sodium. The following results have been obtained by the inventor with these:

	Electromotive Force for each Cell Volts.	Internal Resistance between .25 and .50 Ohms.
Iron	1.1	" "
Zinc	1.6	" "
Sodium amalgam	2.2	" "

Under these conditions the price per horse-power per hour would be .05 franc for iron, .25 to .30 franc for zinc, and 1.25 francs for sodium amalgam, assuming the cost of iron per kilo. to be 5 centimes, that of zinc .5 franc, and that of sodium 5 francs the kilo., a price which will soon be reached. It will be seen that iron is by far the most economical, although its efficiency corresponds to only one-fourth the amount of work done by the sodium. This latter recommends itself on account of its extreme lightness; a cell containing 60 grammes of sodium amalgam placed in a very light leaden receptacle, producing 6 watts of electric work. Besides, where this is employed, the use of chloride of sodium is rendered unnecessary, because the soda liberated suffices to maintain the humidity of the cell. It would therefore appear that the auto-accumulator charged with iron forms a very light battery, since with the standard dimensions of 10 cent. by 10 cent. by 2.5 cent., and with a weight of less than half a pound, an energy of two watts can be obtained. A battery of five of these cells in tension would therefore give 10 watts, and would weigh about one kilogramme. It is very economical, since very cheap materials are obtained; it is easily managed, quickly cleaned, without smell or danger, and occupies very small space. If all these advantages claimed by the inventor are realized, this battery marks a great and real progress, and should be found capable of fulfilling many purposes for which the ordinary types of cells, with their acid liquids and deleterious fumes, are quite unsuited, while if the highly favorable estimate that has been formed of the cost of working be even approximately borne out by practice, it is evident that a great saving will be effected in the chemical production of electric energy. In any case its lightness and small bulk will also adapt it for use in portable lamps for domestic purposes.—*Engineering.*

Phelps Induction Telegraph System.

The officers of the Phelps Induction Telegraph Company are Chas. H. Cheever, president; Henry D. Hall, secretary; and Lucius J. Phelps, electrician and superintendent; and they are well satisfied with the progress being made. This system utilizes the well-known inductive effect of currents of electricity upon conductors parallel to that over which the primary current is sent. The system is in daily practical operation on the Harlem River branch of the New York, New Haven & Hartford Railroad, and has been described at length in the columns of the REVIEW in the past. Among the late indorsements of this invention is the following letter from a practical railroad man, which is as strong as could be desired:

NEW YORK, May 18, 1885.

PHELPS INDUCTION TELEGRAPH COMPANY, New York:

Gentlemen: On the 12th inst. I availed myself of your invitation to examine the Phelps Induction Telegraph System on the Harlem River branch of the N. Y., N. H. & H. R. R, Its practical operation exceeded my most confident expectation, and I feel free to predict that it will take its place, as soon as its merits become known, with the automatic brake, split switch, automatic draw-bar and platform buffers, all of which experience has proven to be indispensable.

I can see no reason why train reports and orders should not be sent and received by the operator on the train, who, in many cases, can be one of the regular train crew.

With this system of telegraphy in use, there would be no need of maintaining telegraph offices on the line where they are required only for the purpose of giving train reports and giving train orders.

Of course, there are many little matters of detail that would have to be arranged by each line using it, to meet its individual requirements, but as a system to be put into every-day use, I am satisfied as to its entire practicability. Very truly yours,

FRANK S. GANNON,
General Superintendent N.Y. C. & H. R. R.

The Novelties Exhibition at Philadelphia, September 15, 1885.

RULES AND REGULATIONS.

The following rules and regulations for the conduct and government of the Novelties Exhibition have been adopted by the Committee on Exhibitions, and approved by the Board of Managers of the Franklin Institute, viz.:

1. The building at Thirty-second Street and Lancaster Avenue will be opened for the reception of the articles and goods intended for exhibition on Monday, August 24th, and remain open for that purpose until Saturday, September 12th. On Tuesday, September 15th, the exhibition will be formally opened to the public at 12 o'clock M., and continue open daily (Sundays excepted), from 10 A. M. to 10 P. M., until Saturday, October 31, 1885.

2. Each exhibitor will be required to pay an entrance fee of $5, for which he will receive one season ticket of admission, not transferable, which will be issued to any one of the members of a firm or corporation that may be exhibitors; additional tickets for other members of a firm, or the executive officers of corporations, being procurable at the same rate for each person. Tickets of admission for the attendants absolutely necessary for the care and operation of the exhibits can be procured free of charge, subject to the regulations of the Committee on Admission, and these tickets are forfeitable if wrongfully used.

The charge for space occupied by exhibits, either on the floor, or under the ground, or suspended above the aisles, or on the walls

(to be paid upon the receipt of permit), will be as follows:

All spaces under 10 square feet.....$2 00
Each additional square foot..... 10

3. All applications for space must be made before September 12th, on printed blank forms, which will be furnished by the committee; and they will be considered and the space allotted to applicants in the order of their reception; and space allotted to exhibitors, but not occupied by September 12th, may be assigned by the committee to other exhibitors. Whenever the articles will admit, exhibitors are requested to display them in glass cases.

Exhibitors will not be allowed to sell or transfer any portion of their space without the written consent of the committee.

4. All articles delivered at the building shall be reported to the committee, which will direct their location and assign them the proper space. All articles shipped to the exhibition by rail or otherwise must have freight and charges prepaid, and invoice and bill of lading mailed to "Committee on Exhibitions, Franklin Institute, Philadelphia, U. S. A."

5. Exhibitors will be expected to have an attendant in charge of their exhibits from 10 A. M. to 10 P. M. daily, to explain to visitors the articles displayed.

6. The committee reserve the right to exclude from the building and premises all articles of a dangerous, or offensive, or otherwise objectionable character.

7. No article can be removed from the building during the time of the exhibition, unless by consent of the committee.

8. A police force will be in attendance upon the premises, and watchmen at night, during the exhibition; but all articles on exhibition will be at the risk of the owner.

9. Power to drive machines will be furnished at the rate of three cents per horse-power per hour, the power to be rated at sixty square feet of belt per minute if the belt be single, and forty square feet per minute if the belt be double; the tension on belt to be subject to the judgment of the engineer of the exhibition in charge, whose decision is final. If machines are driven direct from engines furnished by the exhibitors, the steam used will be rated by indicator, and charged at the same rate per horse-power.

10. Signs will not be allowed of greater size than 1,000 square inches, without written permission from the committee previously obtained. The distribution of circulars, cards, or samples about the building will not be permitted; exhibitors can distribute such things only from their own stands.

11. The arrangement and distribution of electric conductors, and of shafting, piping, etc., shall be subject to the approval of the committee.

12. The judges shall be appointed by the Board of Managers, and shall be men of acknowledged integrity, skill and experience in the class of articles assigned to them; and no judge shall serve on any class in which he may be a competing exhibitor, or otherwise directly interested. The mornings of each day, until fifteen minutes before the time of opening the exhibition, shall be appropriated to the judges, who shall be attended only by such persons as they may invite to be present.

13. All articles entered for competition will be carefully examined by the judges, and premiums will be awarded on such articles as they shall declare worthy—their decisions being based on novelty and intrinsic merit.

14. The premiums to be awarded shall be of three classes:

1st. The silver medal of the Franklin Institute, with a diploma or certificate, setting forth the peculiar merits of the article exhibited.
2d. The bronze medal of the Franklin Institute, with a like diploma.
3d. A diploma or certificate of honorable mention.

Cases of special merit may be referred by the judges to the Committee on "Science and the Arts," with a recommendation for the award of the Scott's legacy premium, or of the Elliott Cresson gold medal.

15. Exhibitors are desired to state in writing to the committee, the peculiar merits claimed for the articles exhibited by them for competition.

16. Exhibitors are required to attach to their exhibit a printed description (in English) of the use and operation of the object exhibited, for public information.

.... The Bankers and Merchants' Telegraph Company have reduced its rates from Boston to 10 cents to New York, Providence, Hartford, Fall River and Newport; 20 cents to Philadelphia, Baltimore and Washington; 25 cents to Chicago, United States Navy Yards, Cleveland, Buffalo, Rochester and Pittsburgh.

.... A dispatch sent out from here says that it has been decided to sell the Bankers and Merchants' plant piecemeal, as the finances of that company are so complicated that they cannot be straightened out otherwise. Parts of the line are likely to fall into Mr. Mackay's hands, but other portions will go to the Western Union and the Baltimore & Ohio. There is no truth in the reported consolidation of all telegraph lines.

.... One of the consequences of the political troubles in Central America has been the military occupation of all the cable stations and the suppression of all telegrams not receiving the approval of the authorities. Even the representatives of foreign nations are not permitted to correspond by telegraph with their governments without submitting their dispatches to the military authorities, who frequently suppress them, especially if they are in cipher.

.... From 1880 to the end of 1884 the number of telegraph stations in Germany rose from 5,114 to 7,529, and the length of wires from 121,520 to 150,040 miles, together with 23,560 miles of underground wire connecting 221 towns. The telephone, which made its *debut* in Germany in 1880, counts to-day 58 systems in cities, with a total of 7,311 subscribers, and comprises a network of 10,110 miles in length. It must be particularly mentioned that the system of the industrial district of Upper Silesia covers an area 1,029 miles square.

.... Judge Phelps, sitting in the circuit court, Baltimore, signed a decree ordering the sale at public auction of all the property of the Bankers and Merchants' Telegraph Company situated in the State of Maryland, upon the bill of complaint of Francis P. Stevens. The bill charges that the two mortgages of $800,000 and $1,000,000 respectively are void and inoperative on account of noncompliance with the State laws as to affidavits and acknowledgment of *bona-fides* of consideration. The Farmers' Loan and Trust Company of New York, trustees under the mortgages, are made parties defendant by order of publication. The property is to to be sold, clear of all incumbrances, on June 18.

.... Electrician C. H. Summers, of the Western Union, Chicago, enjoys a joke. He also perpetrates many during the year. At the last National Republican Convention Mr. Summer's face became familiar to many of the officers, as he had a great deal to do with the excellent news arrangement made by the Western Union. Mr. Summers has a friend, Mr. C. H. Wilson, one of the genial officials of the Central Union Telephone Company, who was unable one afternoon to get through the immense crowds blocking the door to the convention building. A uniformed messenger delivered to Mr. Summers, on the inside, this information, and that worthy gentleman promptly advancing to the door, sang out: "Charles H. Wilson! Charles H. Wilson! The chairman of the convention desires to see Charles H. Wilson!" A voice on the outskirts of the crowd answered, "Here!" and a pathway was immediately opened through the mass of struggling humanity that surrounded the door, and Charles H. Wilson walked bravely through, the crowd making room with the utmost deference for the man the "chairman of the convention desired to see."

—— The Brush incandescent installation at Anniston Inn, Anniston, Alabama, is attracting much favorable comment from guests.

—— There will be erected at Danbury, Conn., four iron towers, 125 feet high, the Schuyler Electric Light Company having contracted with Mr. E. J. O'Beirne, General Manager of the Star Iron Tower Company, of Ft. Wayne, Indiana, to have the towers erected at once.

—— The Jarvis Engineering Co., Boston, Mass., have received orders from the Thomson-Houston International Co. to fit up a steam plant in the city of Lima, Peru. They will set two 60-H. P. boilers with the Jarvis patent setting, and send out two Armington & Sims engines, heaters, pumps, injectors and grate bars.

—— Cleveland is anxious over the discovery that it hasn't funds for the proper lighting of the city. Unless money is obtained from some source the electric and vapor lights will probably be turned out August 1. Money cannot be raised by the issue of bonds and there is no other fund from which it can be drawn at present.

—— The Schuyler Electric Light Company, of Hartford, Conn., has signed a contract for the placing of a 450-light plant in Cincinnati. The purchasers are the A. H. Pugh Printing Company. The plant includes two dynamos with a power of 450 incandescent lamps of sixteen-candle power each. The large printing establishment of the company, and several stores, will be lighted.

—— Mr. J. H. Reid has dissolved his connection with the Electrical Supply Company, and accepted a responsible position with the United States Electric Light Company, with headquarters in Chicago. Mr. Reid is fully equipped for the work undertaken, is familiar with all interests involved, and the United States Company have done a wise thing in securing the services of a man of his capacity and energy.

—— The committee of the Bloomington, Ill., city council sent abroad to discover some method or medium by which the streets of the city could be lighted, has reported the result of their investigation of the illumination problem. After visiting Quincy, Peoria, Detroit and other cities the members of the committee are convinced that electricity is the most practicable, the most reliable and the most economical means of lighting the city. Acting upon this report the council has wisely determined to adopt electric light for public illuminating purposes; a course that will redound to their glory and prove satisfactory to the citizens.

—— The Detroit *Free Press* building is entirely lighted by the incandescent electric light. The paper says: "The general public cannot realize the boon that incandescent lights are to the employes in workshops. In the new composing room of the *Free Press* last night fifty-five men were working by the light of ninety-nine bulbs. The air was cool and healthful and the men worked in comparative comfort. Had there been ninety nine gas jets burning in the room the heat would have been intense and the atmosphere stifling, because of an insufficient supply of oxygen. It would also be heavy with unconsumed carbon. With the incandescent light there is no heat, no carbon, no combustion."

—— Mr. Max Muthel has patented in Germany an incandescent lamp which does not require a vacuum for its maintenance. The filament consists of a mixture of conductors and non-conductors of electricity. He uses magnesia, the silicate of magnesia and porcelain earth of which he makes slender filaments; these he brings to incandescence, and saturates them in a solution of salts of platinum iridium; they are then brought to incandescence, to reduce to metal the absorbed salts. With filaments so prepared, fusion, it is stated, is impossible, owing to the presence of the intermediary non-conducting substances. M. Muthel explains that probably the electric spark passes from particle to particle of the metal, causing, in that way, an ignition of the intervening particles of non-conductor to brilliant incandescence.

ELECTRIC LIGHT NEWS

—— The United States Co. have been awarded the contract for light the State Insane Asylum at Fulton, Mo.; 6 16-candle power lamps are to be used.

—— The 100-light United States plant in the Mortimer building is now running. The dynamo is run by a Buckeye engine, and the lights are distributed through the halls, elevators, &c.

—— The Department of City works of Brooklyn, in its estimates for 1886, present an item of $73,000 for the erection and maintenance of 400 electric lights based upon a resolution adopted by the council.

—— The United States Company have completed its plant in the Hamilton Club, Brooklyn. Some 250 Weston 16-candle power lamps are used, distributed throughout the building, and the gas has been turned off. The result is very gratifying, as not only is illumination very fine, but the work of installing the plant has been done in a thoroughly first class manner.

—— The Detroit Senate Committees on State Capitol and on Appropriations and Finance have reported favorably the bill to light the Capitol with the incandescent electric light. The bill authorizes the Board of State Auditors to make the necessary contracts, and to have the work completed by June 1, 1887. The House has also taken the preliminary steps to act upon the matter. The work, if authorized, can be speedily done, and if the Legislature should hold an extra session next year it can deliberate in an atmosphere unvitiated by the combustion of scores of burning jets of gas. The cost of gas for 1883–4 was $10,060.57, as reported by the Board of State Auditors.

—— The village of Middletown, Ohio, has been considerably torn up by a three-cornered fight between the Brush Electric Light Company, of that town, the local Edison Company and the gas company. Finally, the gas company and the Brush Company united, when the Edison Company arranged to purchase a large block of the gas stock, hoping thereby to obtain control of the Brush Company's plant. The matter was carried into the courts, resulting in a victory for the Brush men. The Brush Company is now lighting the village as in "auld lang syne," under a new $5,000 yearly contract, and the gas company finds that it has no right to engage in an electric lighting business, under the decision of the court, and will probably renew its contest, as a gas company, with the Edison Company for private lighting.

—— The Municipal Electric Light Company, of Brooklyn, invited a number of their friends to the opening of their light station, Nos. 306 and 308 Pennsylvania street, Thursday evening, May 28th. The works were inspected from 7 to 9 o'clock, and a reception and banquet given afterwards at the office of the company, 91 Broadway. There are 150 lights now in use, of the Thomson-Houston system. The building is a solid-looking brick structure, and its dimensions are 60 by 100 feet. The boiler room is 35 feet high and 37 feet long, and the engine room is 53 feet long and 17 feet high. There are five engines of the latest and most improved pattern, which were manufactured by the Buckeye Engine Company, of Salem, Ohio, to which the dynamos are belted direct. The three steel boilers are each seventeen feet long. They were made by Farrel Logan's Sons, of Greenpoint. Col. E. F. Gaylor was the architect for the building, and the steam fitting was the work of James Bulger & Son. The station in completeness and tasty work is one worthy of special notice. President Cooper and Manager De Munde deserve much credit for their enterprise and public spirit in installing such an excellent system, and we hope to see their efforts properly appreciated by the citizens of Brooklyn.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MAY 26, 1885.

318,472 Electric signal bell; Charles Heinzel, New York, N. Y.

318,514 Telephone exchange: John A. Seeley, New York, N. Y.

318,547 Combined gas and electric light fixture; C. Deavs, New York, N. Y., assignor to the Archer & Pancoast Manufacturing Company, same place.

318,571 Combined lightning arrester and test connection; Henry B. Lytle, Boston, Mass., and John A. McCoy, Baltimore, Md.

318,589 Electric motor; Leonidas G. Woolley, Kalamazoo, Mich.

318,594 Electric railway; Benson Bidwell, Philadelphia, Pa., assignor of one-half to Charles F. Bidwell, Indianapolis, Ind.

318,612 Electric alarm clock; Victor Gallet, Brest, France.

318,616 Joint for pipes for water, gas, electric wires, etc.; William Hassall, Beeston, County of Nottingham, England.

318,647 Electric bell; Augustus H. Palmer, Utica, N. Y.

318,664 Armature for dynamo-electric machines; D. A. Schuyler, New York, N. Y., assignor to the Schuyler Electric Light Company, same place.

318,668 Method of operating electrical railway trains; Frank J. Sprague, New York, N. Y., assignor to the Sprague Electric Railway and Motor Company.

318,671 Dynamo-electric machine. Addison G. Waterhouse, New York, N. Y., assignor, by mesne assignments, to the Schuyler Electric Light Company, same place.

318,697 Combined dynamometer and safety valve; P. Clark, Rahway, N. J.

318,828 Secondary battery; Joseph W. Swan, Laureston, Bromley, County of Kent, England.

318,854 Key and Sounder; Perley P. Belt, Columbus, Kansas.

318,907 Telephone; Jose D. Husbands, Valparaiso, Chili, assignor to the American Bell Telephone Company, Boston, Mass.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40.00. Various other Foreign patents may also be obtained.

PARKER RUSSELL
MINING & MANUFACTURING CO.,
711 Pine St., St. Louis.

ELECTRIC LIGHT PENCILS
SUNLIGHT CARBONS

We have completed and in operation our new Factory with a capacity of

100,000 Carbons Per Week.

Using the purest materials and with machinery of our own invention, every carbon is manipulated separately from the beginning of the operation until finished. They are therefore

ABSOLUTELY UNIFORM
And Each Carbon Alike in All its Parts.

In straightness, length of time in burning, brilliancy and steadiness of light, they will excel all others and will be adapted to the various systems of lighting in use.

OKONITE

NEW YORK INSULATED WIRE AND VULCANITE CO.,
13 Park Row, New York.

BUSINESS NOTICE.

Protection for Watches.

Every watchmaker is interested in anything which will reduce the chances of a watch becoming demoralized, for it makes no difference *what* the *cause* of the unsatisfactory performance may be, the watchmaker has to take the "cussing." Magnetism is one of the most fruitful causes of the irregular running of watches, and it is constantly increasing, and every watchmaker should know how to detect this trouble, and explain it to his customer, and how it can be remedied

The following letter explains itself:

"Messrs. Giles Bro. & Co.,
" State and Washington Sts., Chicago, Ill.

"Gents—The followidg description of a test of the Giles Anti-Magnetic Shields, which you placed at my disposal, will in itself indicates the absolute protection against accidental magnetism afforded a watch movement thus encased.

"I first employed your apparatus for demagnetization to completely destroy the polarity of a small but exceedingly sensitive compass needle. Then I enclosed the latter in one of your Shields and placed the same in a powerful magnetic field produced by dynamo current and properly proportioned electro-magnet.

"After removing the compass needle, it was found to possess no directive force whatever, thus demonstrating the protection afforded a watch movement by the use of the Shield.

"The principles of its construction are scientific and practical, and its application is exceedingly neat.

"To those who value accurate timepieces, I sincerely recommend it.

"In these days of telephones and various devices of convenience, many others than electricians suffer from the magnetization of their watches, even if the cause of the poor rate is unknown to them.

"Sincerely yours,
"H. L. BAILEY, Electrician.
"The Telegraph Time Co., Temple Court, New York."

Also one from Prof. Elisha Gray, inventor of the duplex system of telegraphy, and a brilliant electrician:

"CHICAGO, May, 1884.

"Messrs. Giles, Brs. & Co.,

Gentlemen—I have examined the Giles Patent Anti-Magnetic Shield for watch movements, and from the nature of its formation and tests made, I believe it must render the watch proof against magnetic influences which disturb its timekeeping qualities, and will become an invaluable protection for watches of those who may come under the influence of magnetic or electric currents, such as generated by running machinery, dynamo-machines, telegraph and electric light wires, etc., and personal magnetic appliances, as magnetic belts, pads, etc. Yours very truly,

"ELISHA GRAY."

Also a letter from DeW. C. Cregier, the eminent practical engineer, who says:

"CHICAGO, May, 1884.

"Giles, Bro. & Co.,

"Gentlemen—I have tested your Anti-Magnetic Shield for watches, and am convinced it will accomplish the object claimed for it. It is an invention of the greatest importance to those requiring accurate time, and in this day of multiplied electric appliances it must become almost a necessity as a protection for pocket timepieces.

"Yours very truly,
"DEWITT C. CREGIER,
"Commissioner Department of Public Works, City of Chicago."

A descriptive pamphlet, containing interesting details and experiments, will be mailed free upon application to GILES, BRO. & Co.,
Chicago, Ill.

Telegraph and Electrical SUPPLIES
Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue C. E. JONES & BRO. Cincinnati, O.
It is important to us that you mention this paper.

VICTOR
Turbine Water Wheel.

The attention of **Electric Companies** is called to this **celebrated water wheel** as particularly adapted to their use, on account of its **remarkably steady motion, high speed** and **great efficiency,** and **large capacity** for its **diameter,** being **double** the **power** of most **wheels** of **same diameter.** It is used by a number of the leading electric companies with great satisfaction. In the economical use of water it is without an equal, producing the highest per cent. of useful effect, **guaranteed.**

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STILWELL & BIERCE MFG. CO.,
DAYTON, OHIO.

(Please Mention this Paper.)

ELECTRICAL REVIEW
Clubbing List for 1885.

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Scientific American	2 60
" " Supplement	4 00
" " and "	5 65

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SCIENCE and LETTERS.

Entrance Examinations Begin at 9 A. M., June 15 and Sept. 15, 1885.

For the UNIVERSITY REGISTER, giving full information respecting admission, free scholarships, fellowships, expenses, etc., address

Treasurer of Cornell University,
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WANTED.
A few good men accustomed to winding Siemens armatures. Apply by letter only, stating experience and wages required, to
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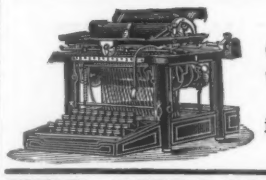

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Standard Type-Writer.
Ask for Particulars Regarding the Use of the Remington Type-Writer in Receiving Messages.
WYCKOFF, SEAMANS & BENEDICT, 339 Broadway, New York.

THE AMERICAN BELL TELEPHONE CO.
95 MILK STREET, BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

Standard Electrical Works,
MANUFACTURERS OF
TELEGRAPH AND TELEPHONE APPARATUS,
Hotel and House Annunciators, Burglar Alarms,
CALL BELLS, "POST'S" MAGNETO BELLS,
PINS and BRACKETS, BATTERIES, &c., &c.
IN STOCK:—FULL LINE
IRON, STEEL and HARD-DRAWN COPPER WIRE, Delivered at Lowest Prices.
ESTIMATES FURNISHED. SEND FOR CATALOGUES AND PRICES.
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